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(12)

INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

KELLY AFB, TEXAS

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

DTIC FILE COPY

FEBRUARY, 1982

ES ENGINEERING-SCIENCE

INSTALLATION RESTORATION PROGRAM
PHASE I - RECORDS SEARCH
Kelly AFB, Texas

Prepared For
United States Air Force
AFESC/DEV
Tyndall AFB, Florida

February, 1982

By
ENGINEERING-SCIENCE, INC.
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This report has been prepared for the U.S. Air Force by Engineering-Science for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force or the Department of Defense.

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CABLE ADDRESS: ENGINSCI
TELEX: 54-2882

February 22, 1982

Mr. Bernard Lindenberg, P.E.
AFESC/DEVP
Tyndall AFB, Florida 32403

Dear Mr. Lindenberg:

Enclosed is the Engineering-Science, Inc. (ES) final report entitled "Installation Restoration Program Phase I Records Search, Kelly AFB, Texas." This report has been prepared in accordance with the ES' proposal dated July 15, 1981 and the Air Force Contract number FO8637-80-G0009, Call #0007.

Presented in this report are introductory background information on the Installation Restoration Program, a description of the Kelly AFB setting, a review of industrial and research and development activities at Kelly AFB, an inventory of major solid and hazardous waste from past activities, a review of past waste handling, treatment and disposal facilities and an evaluation of the pollution potential of each identified site.

We enjoyed the opportunity to work with you and the Kelly Air Force Base personnel who contributed information for the completion of this assessment. Any comments or questions concerning this report should be referred to the Public Affairs Officer at Kelly Air Force Base (2851 ABG).

Very truly yours,

ENGINEERING-SCIENCE, INC.

Gary Christopher

W. G. Christopher, P.E.
Project Manager

WGC/lmr

Enclosure

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EXECUTIVE SUMMARY

Simultaneous to the passage of Resource Conservation and Recovery Act of 1976, the Department of Defense (DOD) devised the Installation Restoration Program (IRP) to identify, report and correct potential environmental deficiencies from past waste management activities that could result in ground-water contamination and probable migration of contaminants beyond DOD installation boundaries. The IRP is a four-phase program consisting of Phase I, Problem Identification/Records Search, Phase II, Problem Confirmation and Quantification, Phase III, Technology Development and Phase IV, Corrective Action. Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Kelly AFB Records Search under Contract No. F08637-80-G0009, Call No. 0007, using funding provided by the Air Force Logistics Command.

INSTALLATION DESCRIPTION

Kelly AFB is located in South Central Texas approximately 150 miles north of Mexico and northwest of the Gulf of Mexico. The base area consists of 4,093 acres of land. Of this area, 3,929 acres are within the immediate boundaries of the base and the remaining 164 acres are located at San Antonio Air Force Station, nine miles northeast of the base, adjacent to Fort Sam Houston. The Kelly Air Force Base Complex is located seven miles from the center of San Antonio within Bexar County and is bounded on the west by Lackland AFB, to the south by Military Highway and Leon Creek, to the east by the Missouri and Pacific Railroad and to the north by the City of San Antonio.

ENVIRONMENTAL SETTING

Several environmental conditions noted at Kelly AFB need to be considered when evaluating past handling and disposal of hazardous waste materials. These are as follows:

- Three abandoned wells identified in the area present a minor potential pathway for waste migration into the Edwards Aquifer by way of deteriorating casing materials.
- Leon Creek traverses Kelly AFB in a north to south direction.
- Base surficial soils are predominantly silts or clays that exhibit characteristically low permeabilities. More permeable, coarser-grained soils are present at ground surface in zones proximate to Leon Creek.
- The Leon Creek sediment analyses have shown heavy met pesticide and herbicide contamination within Kelly AFB.
- Annual net evaporation for the area is -30 inches. T condition reduces the amount of leachate generation fro :ills located on Kelly AFB resulting from precipitation.
- No wetlands exist within the installation boundary.
- Natural populations of either threatened or endangered plants or animals do not exist on the base.
- A municipal wastewater treatment plant discharges to Leon Creek north of Kelly AFB.
- Two city landfills are located adjacent to Kelly AFB. One landfill is located north of Kelly near Lackland AFB and Leon Creek. The second landfill is located just south of Kelly AFB near Leon Creek.
- The primary regional aquifer, the Edwards, underlies Kelly Air Force Base at great depth (998 feet or deeper).
- Kelly Air Force Base lies within the reservoir area and not the recharge zone of the Edwards Aquifer.
- The Edwards Aquifer functions under artesian conditions and is sealed from ground surface by substantial sequences of clay, marl, sandstone, etc.
- A shallow water table (unconfined) aquifer has been shown to exist on base and is probably in communication with base surface waters (Leon Creek) periodically or perenially. The full extent of this aquifer is unknown.

From these conditions it may be concluded that a potential exists for the generation and migration of waste contaminants into and through the shallow aquifer zone. Wastes disposed in areas adjacent to Leon Creek have been placed in the unsaturated portion of this aquifer. The aquifer is present at shallow depths and is recharged directly by precipitation and/or by communication with Leon Creek. Migrating wastes would reasonably be expected to move through the shallow aquifer and enter Leon Creek.

The potential for the generation and subsequent migration of contaminants originating from past waste disposal sites to the deep (Edwards) aquifer is not likely unless migrating wastes encounter an improperly abandoned well and follow deteriorating casing materials downward into the potable water zone (Reeves, 1981).

METHODOLOGY

Interviews were conducted with base personnel (past and present) familiar with past waste disposal practices, file searches were performed for facilities which have generated, handled, transported, and disposed of waste materials, interviews were held with local, state and federal agencies, and site inspections were conducted at facilities that have generated, treated, stored, and disposed of hazardous wastes. Twenty-six sites located on the Kelly AFB property were identified as containing hazardous waste resulting from past waste disposal activites (Figure 1). These sites have been assessed using a rating system which takes into account factors such as site characteristics, waste characteristics, potential for contamination and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1.

FINDINGS AND CONCLUSIONS

Based on the results of the project team's field inspections, review of records and files, and interviews with base personnel, the

FIGURE 1

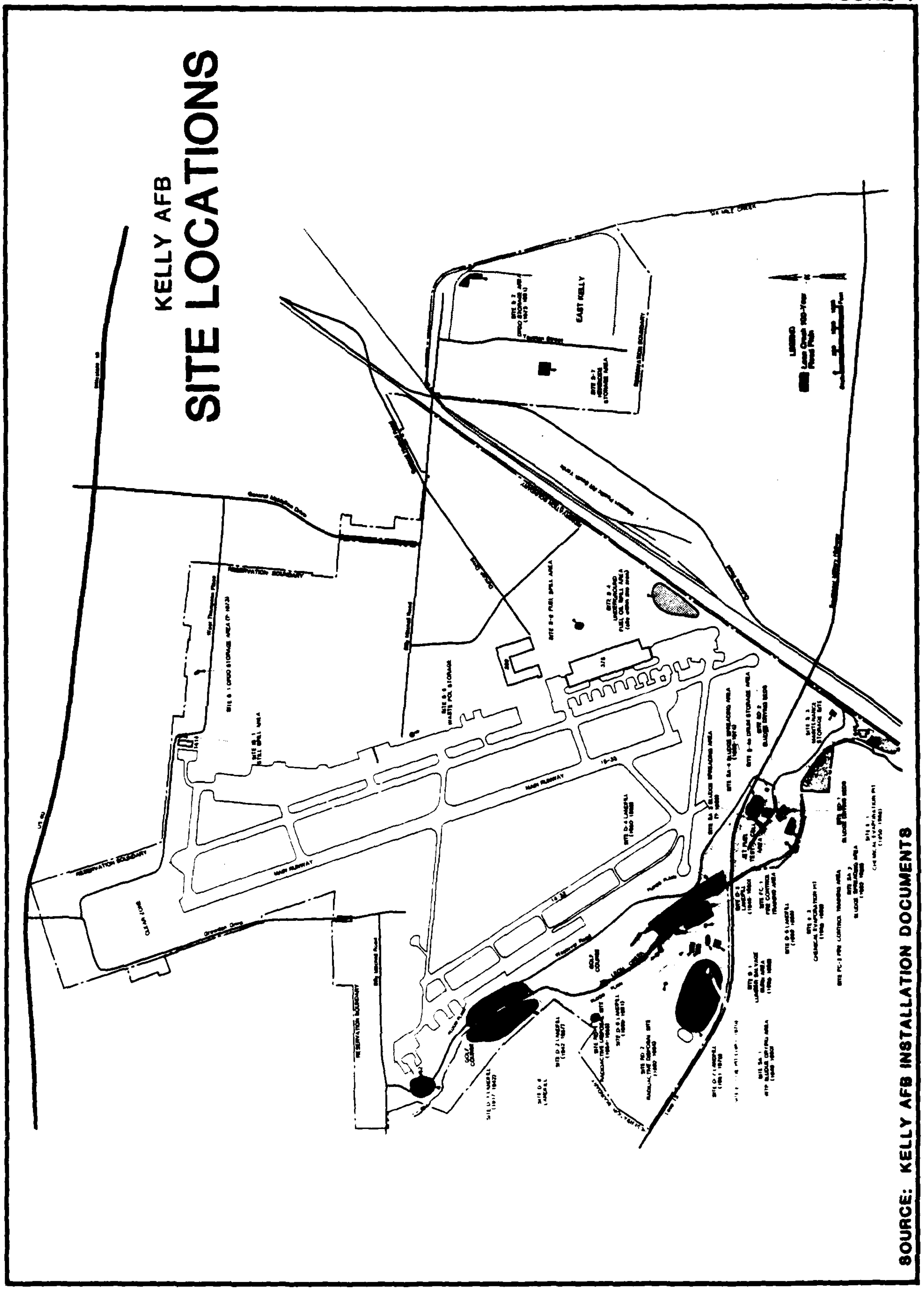

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TABLE 1
PRIORITY RANKING OF POTENTIAL
CONTAMINATION SOURCES

Rank	Site Name	Period of Operation	Score
1	CS-1 Combined Site (D-3, D-5, D-7, SA-1, E-2)	1945-1970	81
2	D-4 Landfill	1950-1958	78
3	D-7 Landfill	1961-1970	77
4	D-3 Landfill	1945-1950	77
5	D-5 Landfill	1958-1959	71
6	D-6 Landfill	1959-1961	70
7	SA-2 Sludge Spreading Area	1962-1980	64
8	D-2 Landfill	1942-1957	61
9	S-1 DPDO Storage Area	?-1943	58
10	E-1 Chemical Evaporation Pit	1940-1966	58
11	S-4 Fuel Spill Area	1980	58
12	E-3 Chemical Evaporation Pit	1966-1980	57
13	E-2 Oil Evaporation Pit	1961-1970	56
14	SA-4 Sludge Spreading Ara	1968-1974	53
15	SA-1 Sludge Spreading Area	1948-1950	52
16	IS-1 Still Spill Area	1955-1972	52
17	S-6 Fuel Spill Area	Mid-1960's	50
18	SA-3 Sludge Spreading Area	?-1969	49
19	S-2 DPDO Storage Yard	1973-1981	48
20	S-7 Herbicide Storage Area	1970's	46
21	SD-2 Sludge Drying Bed	-	46
22	RD-2 Radioactive Disposal Area	1964	45
23	D-1 Landfill	1917-1942	44
24	FC-1 Fire Control Training Area	?-1950's	42
25	FC-2 Fire Control Training Area	1950's-1981	41
26	RD-1 Radioactive Disposal Area	?-1958	40
27	S-3 Maintenance Storage Area	?-1981	38

Notes: (1) This ranking was performed according to the Hazardous Evaluation Methodology described in Appendix G. Individual Site Rating Forms are in Appendix H.

(2) Sites D-1 and D-8 were not rated because they do not represent a potential for contaminant migration.

following conclusions have been developed. The conclusions are listed by category.

1) <u>Landfills</u>

a. Several individual disposal sites (Site Nos. D-3, D-5, D-6, D-7, SA-1, and E-2) will be considered as one combined site in terms of monitoring program development due to the sites proximity to each other on the Kelly AFB golf course and near Leon Creek and the similarity of hazardous wastes disposed at each site. This combined site (CS-1) has a high potential for migration of contaminants to Leon Creek and/or off the installation boundary. The combined site has received a score of 81. Specific conclusions for the individual landfill sites which comprise CS-1 are given below:

1. The Site D-7 landfill (35 acres) operated during 1961-1970 and Site D-3 landfill (5-6 acres) operated during 1945-1950 also have high potential for off-site migration of contaminants. Trench disposal of hazardous waste and sludges in close proximity to Leon Creek (Site D-3) and the installation boundary (Site D-7) has created this situation. These sites have received scores of 77.

2. Sites D-5 and D-6 operated during 1958-1961 received scores of 71 and 70 respectively. All types of sludge and liquid hazardous wastes generated at Kelly including orthodichlorobenzene, cresols, metal plating sludges, mixed solvents, and waste pesticides were disposed in trenches at these two areas. Excavation of the trenches in the alluvial stratum, the proximity of the sites to Leon Creek and the nature of the wastes disposed present a high potential for contaminant migration.

b. The Site D-4 landfill operated during 1950-1958 has a high potential for off-site migration of contaminants. Trench disposal of hazardous wastes on this 15-acre site and within the alluvial stratum immediately adjacent to Leon Creek has created a potential for contaminant migration. The site has received a score of 78.

c. The Site D-2 landfill (28 acres) operated during 1942 to 1957 received a score of 61 due to its proximity to Leon Creek and the nature of wastes disposed in the portion of this landfill located on the southwest side of Leon Creek. Site D-2 has a high potential for contaminant migration to Leon Creek. The landfill portion on the east side of Leon Creek contains construction rubble and presents no potential for contamination.

d. The Site D-1 landfill operated from 1917-1942 was used as a World War I bombing target area and was probably used primarily for disposal of hardfill type materials. Core borings at the Building 962 site did not indicate any oily material disposal. This site received a score of 44 and poses little potential for contamination.

2) <u>Chemical Disposal Pits</u>

a. Chemical Evaporation Pit, Site E-1, was operated from 1950-1966. This site was used for disposal of chromium sludge, contaminated fuels and oils, and hazardous solvents including orthodichlorobenzene and cresols. The site is currently covered by a parking lot. Past spillage and leakage to Leon Creek was observed during the site's active operation. Due to the site's proximity to Leon Creek and the installation boundary and the high mobility of the wastes disposed, a high potential for contaminant migration exists. This site received a score of 58.

b. The Site E-3, Chemical Evaporation Pit, was operated from 1966-1980. The pit was placed into operation for the purpose of evaporating solvent materials such as orthodichlorobenzene. Sludges, waste insecticides, spent solvents and waste materials containing PCB and heavy metals have been disposed at this site. Due to the nature of the wastes disposed, as well as the apparent leachate migration observed from infrared aerial photography, this site presents a high potential for pollutant migration. This site received a rating score of 57.

c. The Oil Evaporation Pit, Site E-2, was used from 1961-1970 to dispose and burn contaminated fuels and oils. This pit received a lower score (56) than the other pits since most of the wastes disposed at this site were burned.

3) Sludge Spreading Areas

a. Since the early 1960's, during periods when the sludge drying beds were inoperative, industrial waste treatment plant sludges containing heavy metals have been diverted to Site SA-2, the Industrial Waste Sludge Lagoon. The site's proximity to Leon Creek and the nature of the wastes disposed gave this site a score of 64.

b. Waste treatment plant sludges have also been land spread at Sites SA-4, SA-1, and SA-3 at various times in the past. These sites received scores of 55, 52 and 49, respectively. These sites are considered a medium potential for contaminant migration.

c. An old sludge drying bed area (Site SD-2), adjacent to the existing sludge drying beds, was used in the past for waste treatment plant sludges. Filtrate from the sludge could potentially contaminate the surficial aquifer. The site presents a low potential for contamination. The site received a score of 46.

4) Storage/Spill Areas

a. Site S-1, the old DPDO Storage Area was used as an intermediate storage area for mixed solvents, carbon cleaning compounds (with orthodichlorobenzene) and waste POL. Tank spillage from loading and unloading often flowed to a low lying pit area. This site was used from the early 1960's through 1973 when DPDO moved to East Kelly. This site represents a high potential for contamination due to the wastes spilled, proximity to the installation boundary and proximity to water supply well Nos. I-74, I-75 and I-80. Non-pumping wells are old and the well construction in terms of grouting and corrosion resistance of

casing materials is questionable. Hence, these abandoned wells present a path of potential migration of contamination to the Edwards Aquifer. This site received a score of 58.

b. At Site S-4, the underground fuel system near building 367, approximately 9000 gallons of fuel was lost in 1980 due to a suspected leak in the underground pipe system. This leak has not yet been precisely located. The pipeline is not currently in operation. It is quite likely that the fuel is still located in the surficial aquifer and presents a potential for migration of contaminants through the alluvial stratum. The site received a score of 58.

c. Spillage of solvents from the Building 1414 solvent recovery still into a nearby ditch (Site IS-1) has occurred in the past. Due to the minor quantities spilled and location of this site, it presents a low potential for contamination. This site received a score of 52.

d. At Site S-3, old Fuel Storage Tank 930, a major spill of approximately 200,000 gallons of AVGAS occurred within the diked area in the mid-1960's. Most of the spill was recovered although an unknown quantity of fuel percolated into the ground in this vicinity because the diked area was unlined. This site presents a low potential for contaminant migration. This site received a score of 50.

e. Another major fuel spill (about 5000 gallons) occurred near the Building 652 pipe rack area (Site SA-3). Most of the fuel was contained although a small amount spilled into Leon Creek. This site received a score of 49 and has a low potential for contaminant migration.

f. Minor spillage of oils and solvents such as trichlorethylene and perchlorethylene occurred at Site S-2, Yard 13 of the DPDO Storage Yard. This site received a score of 48.

5) Radioactive Disposal Sites

a. Site RD-1, the Radioactive Disposal Area, was used prior to 1958 for disposal of low level radioactive wastes such as: electron tubes, oxygen equipment dials marked with luminescent paint, calibration sources from radioactive measuring instruments, spark gaps and parts from voltage regulators which contained small amounts of radioisotopes. Since the wastes are well-contained within a reinforced concrete pipe, the site is well marked, and no radioactive leakage has been detected, based on periodic bioenvironmental engineering surveillance, the site received a low score of 38 and is not considered a potential problem.

b. Radioactive animal tissues were buried at Site RD-2 around 1964. These tissues were transported from Brooks AFB and were buried in a deep ravine in the golf course area and covered with 3-4 feet of earth. This site is unmarked and presently covered with 10-12 additional feet of soil due to golf course construction activities. The tissues which were buried had very short half-lifes. This site received a low score of 45.

6) Fire Control Training Areas

a. The Fire Control Training Areas FC-1 and FC-2 received scores of 42 and 41 respectively and are not considered areas of high potential for ground-water contamination.

RECOMMENDATIONS

The recommendations developed for further assessment of potential off-base contaminant migration are listed in Table 2. These recommendations include ground-water monitoring and sediment monitoring.

TABLE 2

RECOMMENDED MONITORING PROGRAM FOR PHASE II - KELLY AFB

Site	Rating Score	Recommended Monitoring	Comments
CS-1	81	Install monitoring system consisting of one monitoring well hydraulically upgradient and wells installed near the installation boundary from the Leon Creek Underpass at Military Highway northwest to Security Hill at distances not greater than 250 feet center to center. A well is also recommended between Leon Creek and Site E-2. Wells should have a total depth of 35 feet and should be analyzed for the parameters in List A of Table 6.2.	Total wells required: 21
D-4	78	Install a monitoring well system consisting of one upgradient well and three downgradient wells. The wells should have a total depth of 35 feet and be analyzed at a minimum for the parameters in List A of Table 6.2.	
D-2	61	Install a monitoring well system and analytical program similar to the Site D-4 program.	
E-1 E-3	58 57	Install a monitoring system consisting of four wells around the perimeter of each site. A common upgradient well should be established for both sites. The sampling and analysis program should, at a minimum, consist of the analyses in List A of Table 6.2.	
S-4	58	Map subsurface zones degraded by POL contamination using geogphysical methods such as ground penetrating radar or electrical resistivity.	
S-1	58	Install a monitoring well system consisting of four wells located around the site at approximate depths of 25 feet. Analyze these samples for the parameters in List A of Table 6.2.	These wells should be screened through the entire saturated section.
SA-2	64	Obtain well construction data, water levels and site specific geology from the driller for the seven existing wells at Site SA-2.	
Leon Creek Sediment	--	Perform a sediment sampling and analysis study along Leon Creek. Obtain samples at 15 locations specified in Section 6 and analyze for the parameters presented in List B of Table 6.2.	Sampling locations are required near Site Nos. D-1, D-2, D-4, D-5, SA-2, and E-1.

SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

AUTHORITY

In 1976 the DOD devised a comprehensive Installation Restoration Program (IRP). The purpose of the IRP is to assess and control migration of environmental contamination that may have resulted from past operations and disposal practices on DOD facilities and probable migration of contaminants beyond the DOD installation boundaries. In response to RCRA and in anticipation of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (Superfund), the DOD issued DEQPPM 80-6 (June 1980 Defense Environmental Quality Program Policy Manual) requiring identification of past hazardous waste disposal sites on DOD. The U.S. Air Force implemented DEQPPM 80-6 by message in December, 1980. The program was revised by DEQPPM 81-5 (11 December 1981) which reissued and amplified all previous directives and memoranda on the IRP in January, 1982.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phase program as follows:

Phase I - Problem Identification/Records Search

Phase II - Problem Confirmation and Quantification

Phase III - Technology Base Development

Phase IV - Corrective Action

The Problem Identification/Records Search phase (Phase I) is directed towards providing answers to the following questions:

1. What hazardous materials have been used on the installation?
2. How have the wastes been managed?
3. Was the waste management procedure adequate to immobilize, contain, treat, destroy or detoxify the waste?
4. By what routes or means (if any) can the wastes migrate?

5. What effects could occur (or might have occurred) through the discharge or release of the wastes?

The purpose of this report is to summarize and evaluate the information collected during Phase I of the IRP.

Future Phase II and Phase IV efforts will be directed towards:

1. Actions necessary to confirm the existence and extent of an identified potential contamination problem (Phase II)
2. Corrective measures as necessary to remedy the problem (Phase IV).

Phase I Project Description

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Kelly AFB, and to assess the probability of contaminant migration beyond the installation boundary. The activities undertaken by Engineering-Science (ES) in Phase I included the following:

- Review site records
- Interview personnel familiar with past generation and disposal
- Inventory wastes
- Determine quantities and locations of past hazardous waste storage, treatment and disposal
- Evaluate disposal practices and methods
- Determine adequacy of storage, treatment and disposal facilities
- Gather pertinent information from federal, state and local agencies
- Assess potential for contamination
- Determine potential for materials to migrate off site
- Conduct field inspection

In order to perform the on-site portion of the Records Search phase, ES assembled the following core team of professionals whose qualifications are presented in Appendix A:

- W. G. Christopher, Environmental Engineer and Project Manager, ME, 6 years of professional experience
- J. R. Absalon, Hydrogeologist, BS Geology, 8 years of professional experience

- B. D. Moreth, Biologist, BS in Zoology and BS in Forest Science, 10 years of professional experience
- G. C. Patrick, Environmental Engineer, ME, 4 years of professional experience

The on-site portion of the Records Search phase was performed at Kelly AFB on September 21, 1981 and October 13 through October 16, 1981. During this period formal interviews were conducted with key base personnel. File searches were conducted within several key organizations which generate, handle, transport, and dispose of waste materials. The on-site period site visits and field reconnaissance were conducted at all identified facilities that treated, stored or disposed of hazardous materials. These facilities include landfills, waste treatment facilities, material storage areas, laboratories, industrial shops and other support facilities. The information collected during this intensive records search is summarized and evaluated in subsequent sections of this report.

METHODOLOGY

The methodology utilized in the Kelly AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas of the base. The interviewees included current and past environmental personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineer's office, and the Directorate of Maintenance. Several current or past personnel associated with the wastewater treatment plant, the pesticide operations, fuels management and the base solid waste disposal areas were interviewed extensively. Finally, experienced personnel from the tenant aircraft related organizations were interviewed.

Concurrent with the base interviews the applicable federal, state and local agencies were contacted for pertinent base related environmental data.

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous wastes from the various operations on the base.

Included in this part of the activities review was the identification of all known past landfill sites and burial sites; as well as any other possible sources of contamination such as fuel-saturated areas resulting from large fuel spills.

A general ground tour of identified sites was then made by the ES Project Team to gather site specific information including (1) evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous waste contamination in any of the identified sites. If not, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination off the installation boundaries was made by considering site-specific soil and ground-water conditions. If there was little potential for contaminant migration, then the site was deleted from further consideration. If the potential for contamination migration was considered significant, then the site was evaluated and prioritized using the site rating methodology.

The site rating indicates the relative potential for contaminant migration at each site. For those sites showing a higher potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a medium potential, a limited Phase II program may be recommended to confirm that a contaminant migration problem does or does not exist. For those sites showing a lower potential, no further follow-up Phase II work would be recommended.

SECTION 2

INSTALLATION DESCRIPTION

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Kelly AFB is located in South Central Texas (Figure 2.1) approximately 150 miles from Mexico and the Gulf of Mexico. The base area consists of 4,093 acres of land. Of this area, 3,929 acres are within the immediate boundaries of the base and the remaining 164 acres are located at San Antonio Air Force Station, approximately nine miles northeast of the base, adjacent to Fort Sam Houston. The base was founded in 1917 as the first military air base in the State of Texas. A brief installation history is presented in Appendix B.

The Kelly Air Force Base Complex is located approximately seven miles from the center of San Antonio within Bexar County and is bounded on the west by Lackland AFB and to the south by Military Highway and Leon Creek. The base location is shown in relationship to adjacent boundaries and physical features in Figures 2.1 and 2.2.

ORGANIZATION AND MISSION

Kelly's primary mission can be closely identified with the mission of the San Antonio Air Logistics Center (SA-ALC) of the Air Force Logistics Command. SA-ALC is the systems support manager for the Military Airlift Command's C-5 Galaxy jet transport fleet. In addition, SA-ALC is responsible for depot maintenance for the Strategic Air Command's B-52 bomber fleet. Although SA-ALC also manages more than one-half of the entire Air Force engine inventory, the entire inventory of aerospace ground equipment, several special communication and meteorological systems, precision measuring equipment, and all life support equipment. This equipment is not all maintained at Kelly AFB. The SA-ALC manages the fuels, oil, and petroleum program for the Air Force, including liquid oxygen, nitrogen and special fuel for lunar landing modules.

FIGURE 2.1

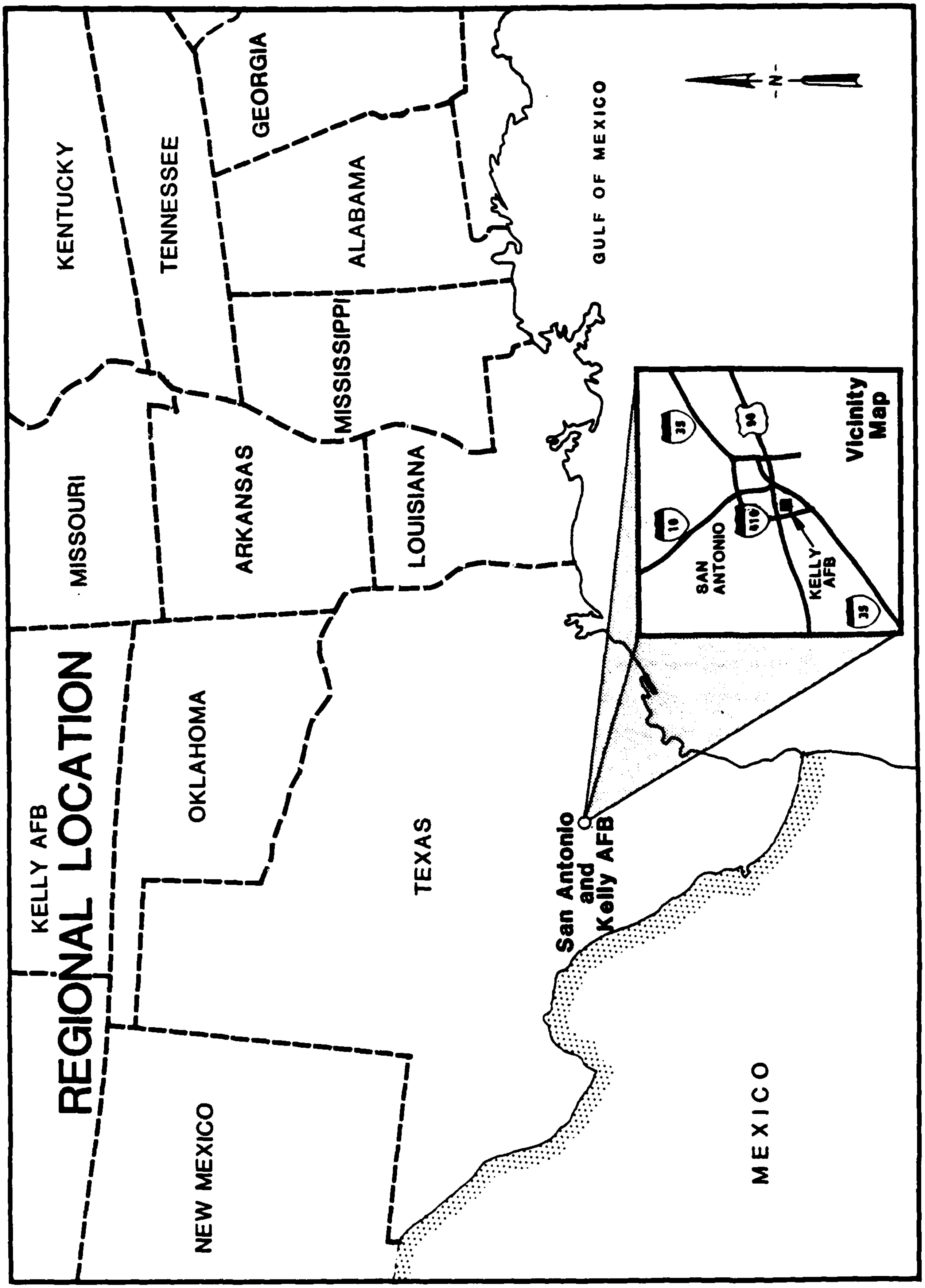
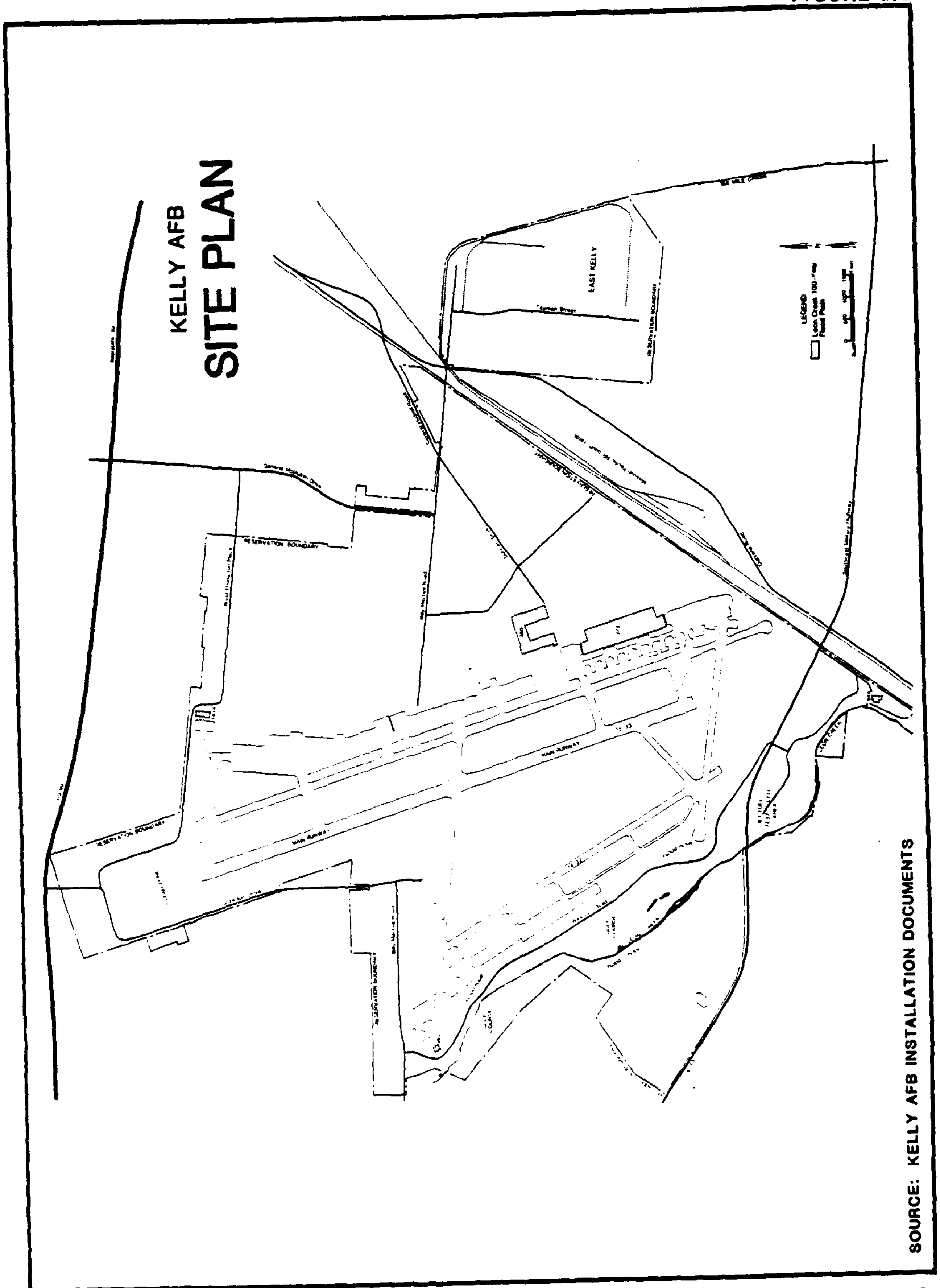

KELLY AFB
REGIONAL LOCATION
KENTUCKY
TENNESSEE
GEORGIA
ALABAMA
MISSISSIPPI
GULF OF MEXICO
N
MISSOURI
ARKANSAS
LOUISIANA
OKLAHOMA
TEXAS
NEW MEXICO
MEXICO
San Antonio and Kelly AFB
Vicinity Map
SAN ANTONIO
KELLY AFB
35
90
10
410
35

FIGURE 2.2



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

Additionally, SA-ALC manages all of the Air Force missile re-entry systems to determine whether they would have performed as intended if they had been launched. The SA-ALC also manages the working dog program for patrol, sentry, scout, tracker and narcotics detection duty for all military services and other government agencies. In addition, SA-ALC is responsible for the management of Air Force watercraft, ranging from rescue boats to tankers, which supply early-warning radar sites and are used to train aircraft crews in sea survival. Management responsibilities of SA-ALC also include the support of 53 nations through the international logistics program. As an industrial facility, SA-ALC operates an enormous overhaul and modification complex engaged in repairing and upgrading aircraft, and a variety of aircraft engines.

Kelly AFB acts as host to approximately 56 tenant organizations which represent the Air Force, the Army, the Department of Defense, and various other government agencies (see Appendix B for further description). The following list includes most of the major tenants on base:

Electronics Security Command

433rd Tactical Airlift Wing

Texas Air National Guard, Headquarters
149th Tactical Fighter Group

375th Aeromedical Airlift Wing, Detachment 5

USAF Postal and Courier Service, Detachment 22

1827th Electronics Installation Squadron

2954 Combat Logistics Support Squadron

General Accounting Office

General Service Agency Area Utilization Office

1923rd Communications Group

Det 4, 3025th Management Engineering Squadron

HQ Air Force Commissary Service
Det 7, 17th Weather Squadron

Det 1016, AFOSI 10th District

6th Weather Squadron, Detachment N06

AF Audit Agency Kelly Office

Defense Property Disposal Facility SAT

U.S. Customs Service, Air Support Branch

The organization and mission of Kelly AFB has remained basically as described here for the past 34 years.

SECTION 3

ENVIRONMENTAL SETTING

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Kelly Air Force Base is described in this section with the primary emphasis directed toward identifying features that may affect the movement of hazardous waste contaminants off base. Environmental conditions pertinent to this study are presented at the end of the section.

METEOROLOGY

Temperature, precipitation and other relevant climatic data furnished by Detachment 7, 15th Weather Squadron, Kelly AFB are presented in Table 3.1. The indicated period of record is 43 years. The summarized data indicate that net annual precipitation is -30 inches. This condition reduces the amount of leachate generation from landfills located on Kelly Air Force Base resulting from precipitation.

GEOGRAPHY AND TOPOGRAPHY

The San Antonio area lies within two distinct physiographic regions, the Edwards Plateau Section of the Great Plains Province and the West Gulf Coastal Plain, as depicted on Figure 3.1. The two regions are separated by the east-west trending Balcones Escarpment. Dissection by stream activity has created distinct relief on the Edwards Plateau; typically, elevations range from 1100 to 1900 feet MSL. The plateau is significant to this project as it serves as the precipitation catchment for surface waters flowing to aquifer recharge zones and streams extending through the study area.

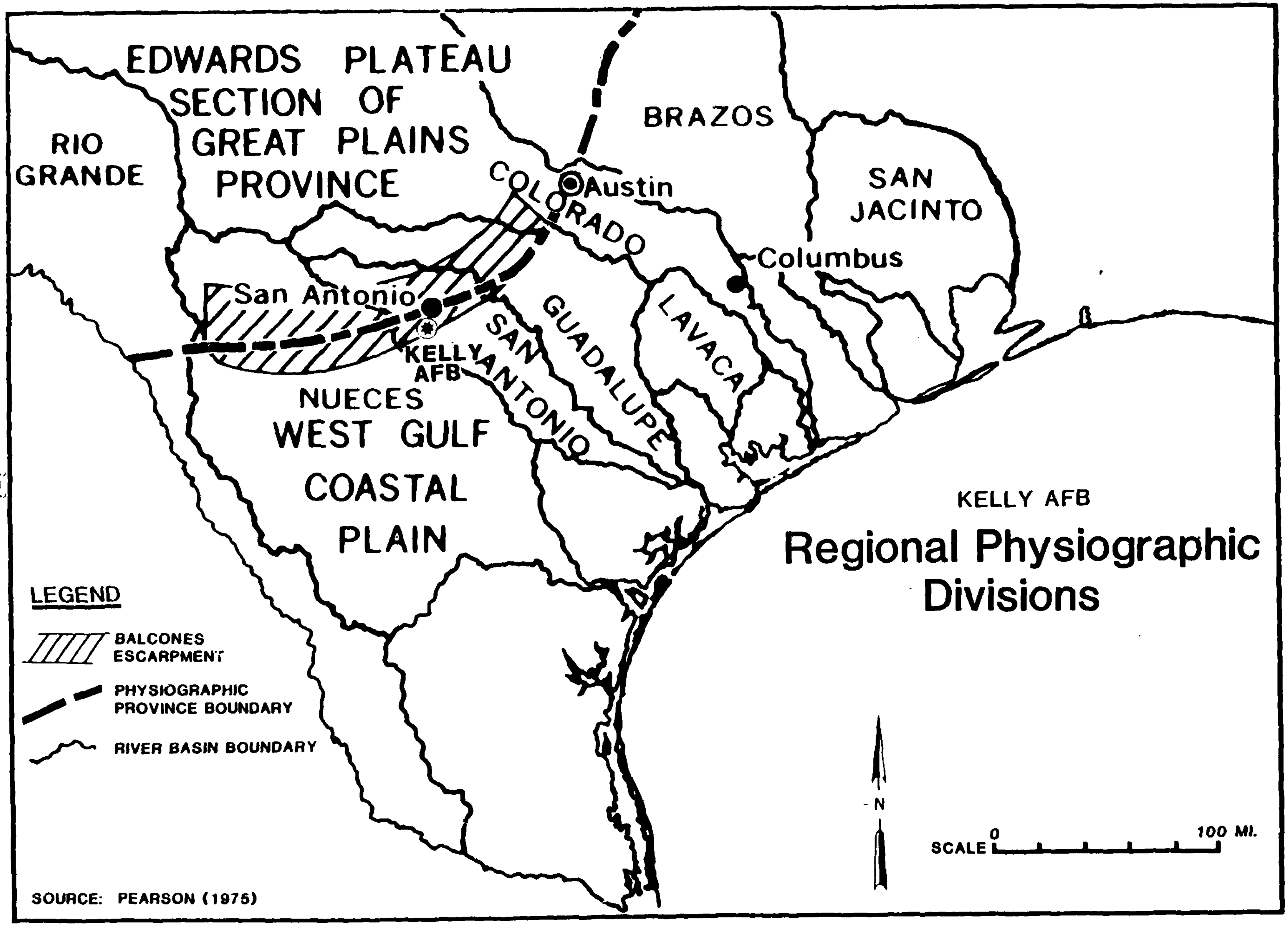
The Balcones Escarpment, located northwest of the base, was created by the faulting of underlying geologic units and is significant since this area corresponds to the recnarge zone of the major regional aquifer. Relief changes abruptly across the escarpment, with elevations ranging from approximately 1100 feet to 700 feet MSL. Kelly Air Force Base is located on the West Gulf Coastal Plain, some 15 miles south of the

TABLE 3.1

WEATHER CONDITIONS AT KELLY AFB, TEXAS

Month	Temperature Mean Max (°F)	Temperature Mean Min (°F)	Rainfall Precipitation Mean (in)	Rainfall Precipitation Max (in)	Snowfall Precipitation Mean (in)	Snowfall Precipitation Max (in)	Wind Mean Speed kts	Wind Prevailing Direction
Jan.	62	41	1.5	9.5	0	4	6	N
Feb.	66	44	1.8	5.9	0	4	6	N
Mar.	74	51	1.3	3.7	0	4	7	SSE
Apr.	80	60	2.6	10.2	0	0	7	SE
May	86	67	3.6	9.3	0	0	6	SSE
June	92	73	2.5	9.2	0	0	6	SSE
July	95	74	1.7	6.1	0	0	6	SSE
August	95	74	2.8	15.1	0	0	5	SSE
Sept.	90	64	3.9	13.5	0	0	5	S
Oct.	82	60	3.0	9.0	0	0	5	S
Nov.	71	49	1.8	5.1	0	0	6	N
Dec.	65	43	1.3	4.0	0	0	5	N

Elevation: 690 feet
Period: September 1937-August 1980
Source: Detachment 7, 15th Weather Squadron



KELLY AFB

Regional Physiographic Divisions

escarpment. The Coastal Plain consists of a gently undulating prairie, where elevations typically range from 450 feet to approximately 700 feet, MSL. The plain slopes to the southeast gradually toward the Gulf of Mexico. Kelly Air Force Base relief varies from 700 feet MSL at the northern extent of the main instrument runway clear zone to approximately 615 feet MSL along segments of the cut incised by Leon Creek, at the southwest corner of the base.

DRAINAGE

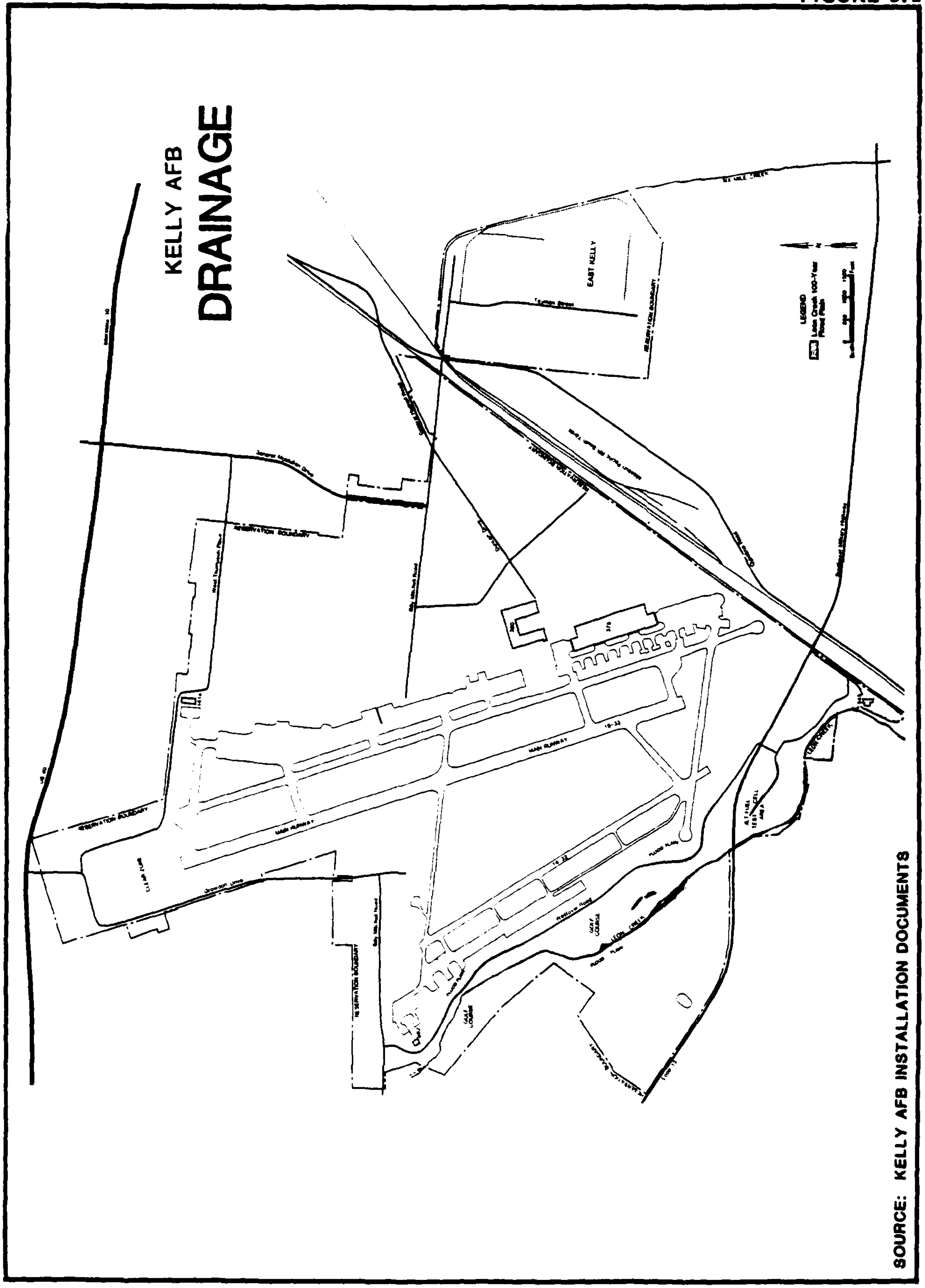
Drainage of base land areas is accomplished by overland flow to gullies and swales which direct flow to Leon Creek, the main stream of consequence in the study area. In addition, Six Mile Creek originates from storm water discharge from East Kelly. Six Mile Creek is a tributary of the San Antonio River and Leon Creek is a tributary of the Medina River which drains to the San Antonio River. Installation drainage is depicted on Figure 3.2.

SURFACE SOILS

Surface soils of the installation area have been studied by the USDA, Soil Conservation Service (1966) and by McIntosh and Behm (1967). Eleven soil types have been mapped within installation boundaries and are depicted on Figure 3.3. The individual soil types are described on Table 3.2. Base soils are typically alluvial, predominantly poorly drained, fine-grained soils possessing generally low permeabilities. According to McIntosh and Behm (1967) gravelly clays underlie surficial soils at depth ranging from two feet below ground surface along the golf course hillsides to ten feet just east of the main instrument runway and at East Kelly. The average thickness of the gravelly clay layer is reported to be five feet. Installation surface soils are underlain by older alluvium. The alluvium varies in thickness from 23 feet at Well I-61 to 60 feet at Well I-97.

GEOLOGY

The geology of the San Antonio area has been reported by Sellards, et al. (1932, reprinted 1981), Arnow (1959 and 1963), McIntosh and Behm (1967) and the Texas Bureau of Economic Geology (1974), among others. A



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

FIGURE 3.3

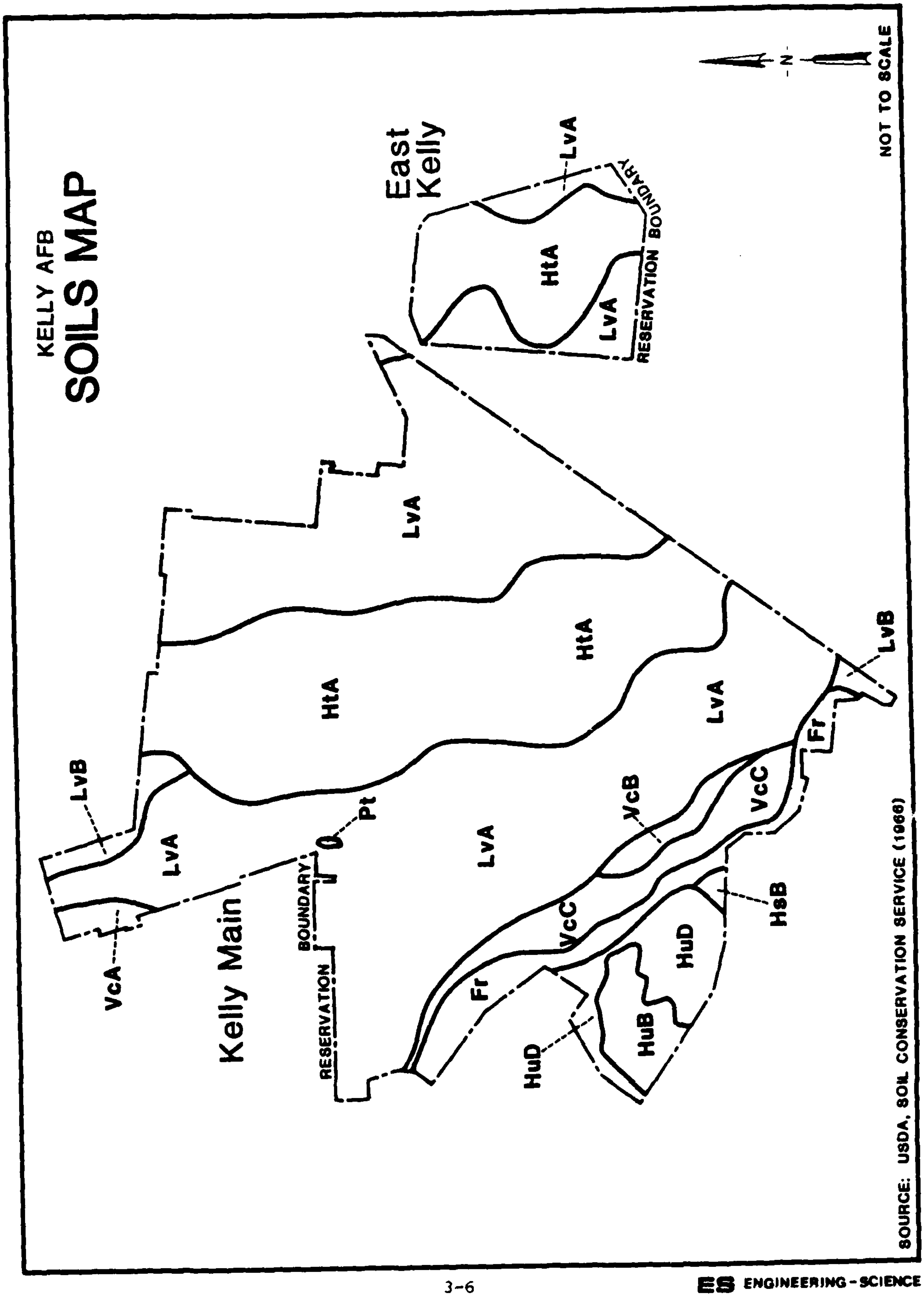

KELLY AFB
SOILS MAP
East Kelly
Kelly Main
RESERVATION BOUNDARY
LvA
HtA
LvB
VcA
Pt
VcB
VcC
Fr
HuD
HuB
HsB
N
NOT TO SCALE
SOURCE: USDA, SOIL CONSERVATION SERVICE (1966)

TABLE 3.2
KELLY AIR FORCE BASE SOILS CLASSIFICATIONS

Symbol	Description	Thickness, in.	Unified Classification	Permeability, in/hr*
Fr	Frio clay loam. Clay and sandy loam over gravel locally	36-92	CL, CH over GM, SM or CL	1.0-2.5
HsB	Houston black clay. Clay, silty clay, gravel chalk, marl 1-3 percent slopes	38-84	Ch, CL	0.1-0.6
HtA	Houston black clay. Clay. Gravelly clay loam. 0-1 percent slopes	42-120	CH, CL or GC	0.3-1.5+
HuB	Houston black gravelly clay. Gravelly clay over clay 1-3 percent slopes.	36-60+	GC, CH	0.2-0.8
HuD	Houston black gravelly clay. Gravelly clay over clay. 5-8 percent slopes	36-60+	GC, CH	0.2-0.8
LvA	Lewisville silty clay. Silty clay, silty clay loam, gravel. 0-1 percent slopes	0-62	CL	1.0-1.2
LvB	Lewisville silty clay. Silty clay, silty clay loam, gravel. 1-3 percent slopes	0-62	CL	1.0-2.0
Pt	Pits and quarries. Sand and/or gravel, locally.	unknown	Not classified	**High
VcA	Venus clay loam. Clay loam, loam, gravel. 0-1 percent slopes	16-72	CL, ML, GM	1.0-1.2
VcB	Venus clay loam. Clay loam, loam, gravel. 1-3 percent slopes	16-72	CL, ML, GM	1.0-1.5
VcC	Venus clay loam. Clay loam, loam, gravel.	16-72	CL, ML, GM	1.0-5.0+

Source of Data: United States Department of Agriculture Soils Conservation Service (1966).

* Although this characteristic of base soils is called "Permeability" by the Soil Conservation Service, it is actually a description of infiltration rates - the speed that water moves through unsaturated soils.

** Estimated to be "highly permeable."

brief review of the published information has been summarized in support of this investigation.

Stratigraphy

Geologic units ranging in age from Cretaceous to Quaternary have been described in the San Antonio area and are presented as Table 3.3. The lithologies of these units include unconsolidated materials and sedimentary rocks.

Distribution

The area of significant geologic units relevant to this study are mapped as Figure 3.4, which has been modified from the work of Arnow (1959 and 1963) and McIntosh and Behm (1967,. Generally, the upper geology of Kelly Air Force Base is dominated by thick sections of marls of the Navarro and Taylor Groups. Geologic sections A-A' and B-B' are presented as Figure 3.5 and 3.6, respectively.

Structure

Kelly Air Force Base occupies a position within the tectonically significant Balcones Fault Zone. Normal faulting in this area has been attributed to the settlement of the Gulf of Mexico geosyncline, which is presently receiving large quantities of terrestrial sediments. Faulting has occurrred along parallel lines trending roughly from southwest to northeast across the study area. The faulting is significant because it has modified the gross structure of area geologic units and has permitted the development of secondary porosity in some units. According to Arnow (1959) many of the faults are not traces of discrete separation but are actually shatter zones which have created a series of smaller step faults along parallel lines. Displacement along individual fault lines may vary from a few tens of feet to several hundred feet, with the greatest amount of movement occurring near the fracture center. Total vertical displacement observed in strata extending between the Edwards Plateau and the Coastal Plain is on the order of 3000 feet.

The sedimentary rocks of Bexar County tend to strike east-northeast and dip south-southeast toward the Gulf of Mexico. In the north part of the county, the dip averages ten to fifteen feet per mile (relatively flat). In the southern part of the county the dip increases to 150 feet per mile, which may be due in part to the previously discussed faulting. According to the work of McIntosh and Behm (1967), compartmentalized

TABLE 3.3
SAN ANTONIO AREA GEOLOGIC UNITS
KELLY AIR FORCE BASE

System	Series	Group	Stratigraphic unit	Approximate maximum thickness (feet)	Character of material	Water-supply properties
Quaternary	Recent and Pleistocene		Alluvium	45	Silt, sand, and gravel.	In places yields water for stock and and domestic wells.
Tertiary	Pliocene		Uvalde gravel	30	Coarse flinty gravel in matrix of clay or silt.	Not known to yield water to wells in Bexar County.
Tertiary	Eocene	Claiborne	Mount Selman formation	200	Sand and clay with iron concretions.	Not know to yield water to wells in Bexar County.
			Carrizo sand	800	Coarse to medium-grained sand and sandstone;some clay.	Yields moderate supplies of potable water.
		Wilcox	Undifferentiated deposits	1,070	Thin-bedded sand and sandstone and some clay, lignite and calcareous concretions.	Yields moderate supplies of water of good to poor quality.
	Paleocene	Midway	Wills Point formation	490	Arenaceous clay containing numerous arenaceous and calcareous concretions.	Not known to yield water to wells in Bexar County.
Cretaceous	Gulf	Navarro	Kemp clay, Escondido formation, and Corsicana marl	535	Clay and marl.	Not known to yield water to wells in Bexar County.
			Taylor marl	540	Marl and calcareous clay.	Not known to yield water to wells in Bexar County.
			Anacacho limestone	355	Marly chalk.	Not known to yield water to wells in Bexar County.
			Austin chalk	210	Limestone and argillaceous chalky limestone.	Yields small to large supplies of water of good to poor quality.
			Eagle Ford shale	40	Calcareous and sandy shale and some argillaceous limestone.	Not known to yield water to wells in Bexar County.

TABLE 3.3 (Continued)

System	Series	Group	Stratigraphic unit	Approximate maximum thickness (feet)	Character of material	Water-supply properties
Cretaceous (Continued)						
	Comanche	Washita	Buda limestone	80	Dense, hard limestone.	Yields sufficient water near the outcrop for stock and domestic use.
			Grayson shale (Del Rio clay)	60	Blue clay, weathering greenish and yellowish brown.	Does not yield water to wells in Bexar County.
			Georgetown limestone	65	Hard massive limestone and argillaceous limestone.	Yields large supplies of water for municipal, industrial, and irrigation supplies. Forms the principal aquifer in the county. Water is highly mineralized downdip in the southern part of the county.
		Fredericksburg	Edwards limestone	600+	Hard semicrystalline massive limestone and dolomite and some thin-bedded limestone and marly limestone.	
			Comanche Peak limestone	40	Light-gray massive limestone and marl.	
			Walnut clay	20	Sandy clay or marl.	Not known to yield water to wells in Bexar County.
		Trinity	Glen Rose limestone	1,200	Massive chalky limestone alternating with beds of less resistant marly limestone.	Generally yields sufficient water in the outcrop for stock and domestic use. Water from deeper wells generally is more highly mineralized than is water from shallow wells.
			Pearsall formation	190	Shale and limestone.	Not known to yield water to wells in Bexar County.
	Pre-Comanche (Coahuila of Mexico)	(Nuevo Leon of Mexico)	Sligo formation	1,100	Limestone, dolomite, and shale.	Not known to yield water to wells in Bexar County.
		(Nuevo Leon and Durango of Mexico)	Hosston formation		Limestone, shale, and sandstone.	Yields small to moderate supplies of water which becomes more highly mineralized downdip toward the southern part of the county.
Pre-Cretaceous			Sedimentary and metamorphic		Slate, black limestone, and schist.	Not known to yield water to wells in Bexar County.

Source: Arnow, 1959

FIGURE 3.4

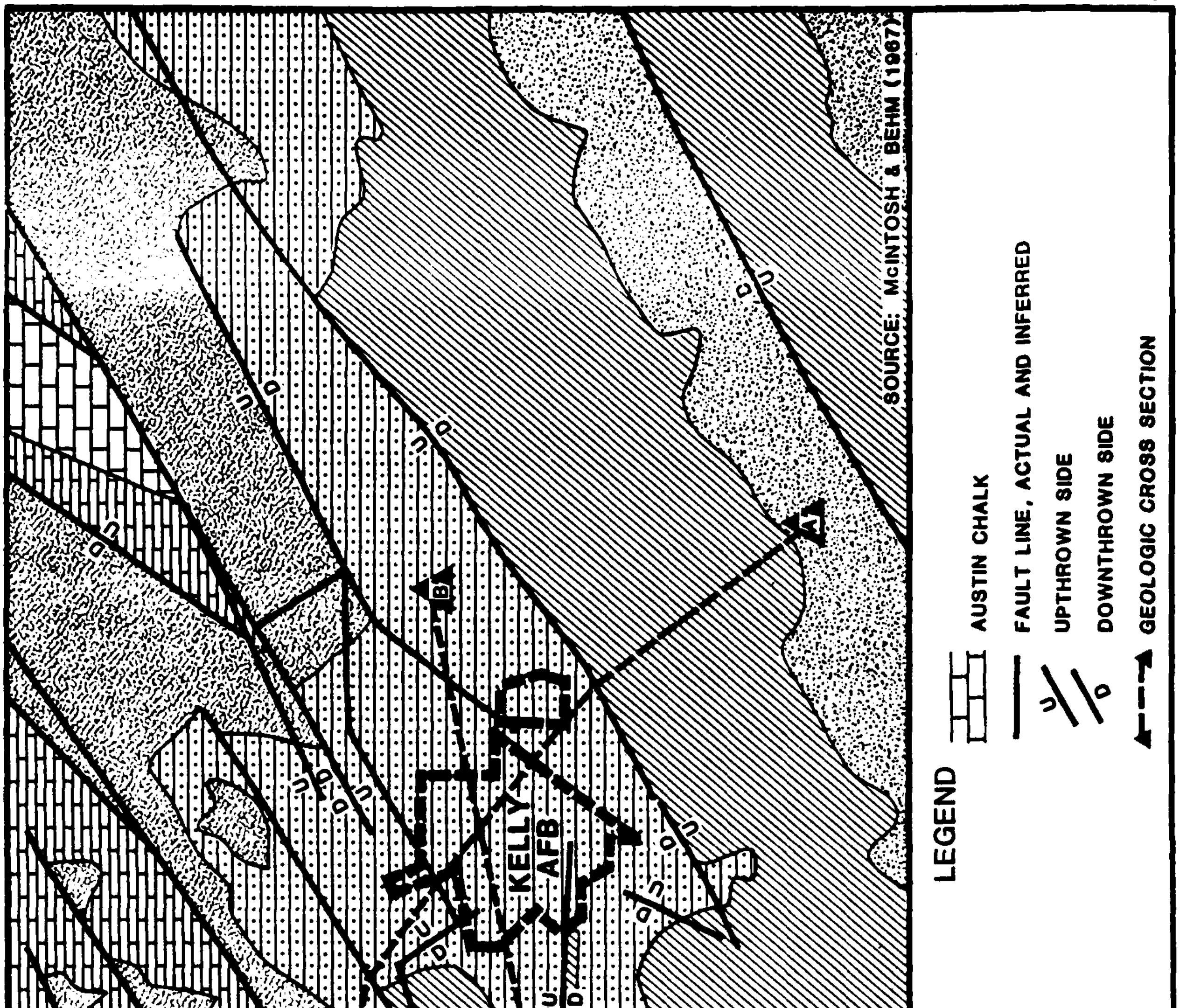

KELLY AFB
SURFACE GEOLOGY
KELLY AFB
SOURCE: McINTOSH & BEHM (1967)
LEGEND
WILCOX GROUP, UNDIFFERENTIATED
WILLS POINT FORMATION
NAVARRO GROUP
TAYLOR MARL
ANACACHO LIMESTONE
AUSTIN CHALK
FAULT LINE, ACTUAL AND INFERRED
UPTHROWN SIDE
DOWNTHROWN SIDE
GEOLOGIC CROSS SECTION

FIGURE 3.5

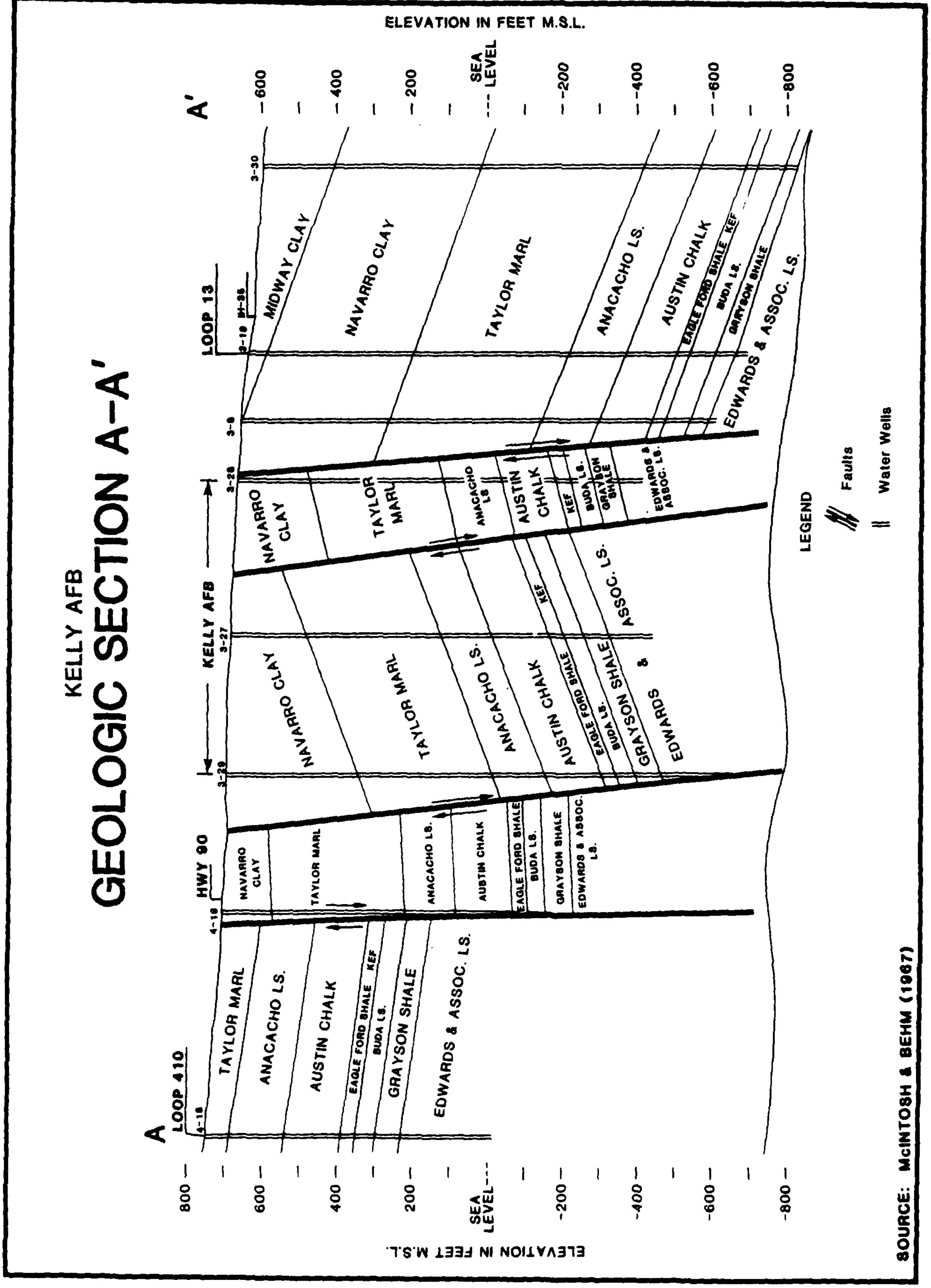
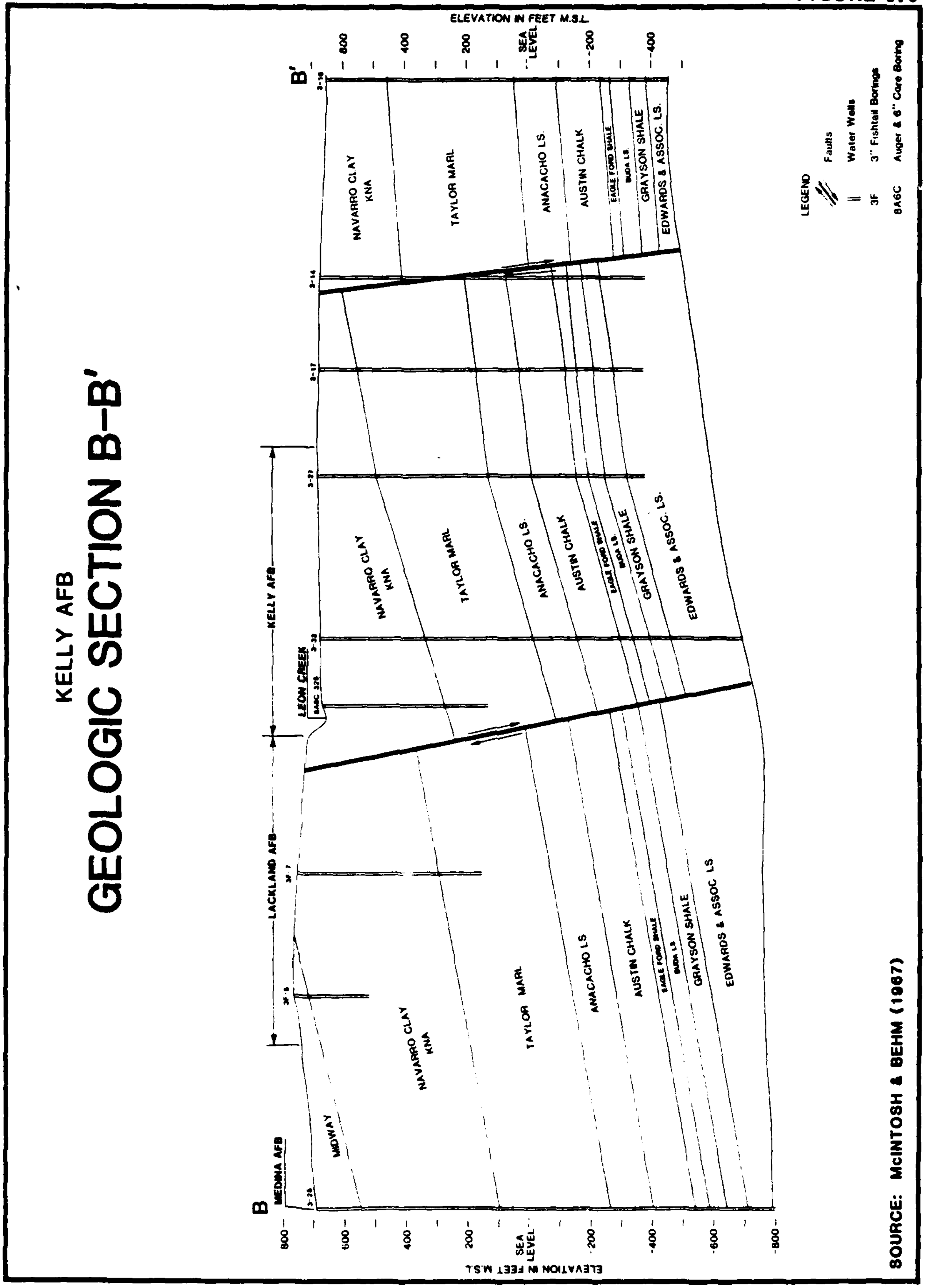

KELLY AFB
GEOLOGIC SECTION A–A′
A
A′
ELEVATION IN FEET M.S.L.
800
600
400
200
SEA LEVEL
-200
-400
-600
-800
LOOP 410
HWY 90
KELLY AFB
LOOP 13
4-16
4-18
3-29
3-27
3-28
3-8
3-18
3-30
MIDWAY CLAY
NAVARRO CLAY
TAYLOR MARL
ANACACHO LS.
AUSTIN CHALK
EAGLE FORD SHALE
BUDA LS.
KEF
GRAYSON SHALE
EDWARDS & ASSOC. LS.
LEGEND
Faults
Water Wells
SOURCE: McINTOSH & BEHM (1967)

FIGURE 3.6


KELLY AFB
GEOLOGIC SECTION B-B'
SOURCE: McINTOSH & BEHM (1967)
ELEVATION IN FEET M.S.L.
800
600
400
200
SEA LEVEL
-200
-400
-600
-800
B
B'
MEDINA AFB
LACKLAND AFB
KELLY AFB
LEON CREEK
MIDWAY
NAVARRO CLAY KNA
TAYLOR MARL
ANACACHO LS.
AUSTIN CHALK
EAGLE FORD SHALE
BUDA LS.
GRAYSON SHALE
EDWARDS & ASSOC. LS.
LEGEND
Faults
Water Wells
3F 3" Fishtail Borings
8A6C Auger & 6" Core Boring

faulting may have altered local strike and dip relationships from the reported regional trends. This may be seen in the Geologic Sections, Figures 3.5 and 3.6, where displacement along major fault lines has modified regional conditions within relatively confined zones beneath Kelly Air Force Base.

HYDROLOGY

Ground-water hydrology of the Kelly Air Force Base-San Antonio area has been reported by Arnow (1959, 1963), Garza (1962), Pearson et al. (1975), Baker and Wall (1976), Maclay and Small (1976), USBR (1978), Metcalf and Eddy, Inc. (1979), Muller and Price (1979), Marquardt and Elder (1979), Maclay et al. (1980), and Maclay et al. (1981). Additional information has been obtained from interviews with officials of the U.S. Geological Survey Water Resources Division, the Edwards Underground Water District and the U.S. Bureau of Reclamation. Information describing shallow aquifer conditions was obtained from installation data documenting a ground-water monitoring program presently being conducted at the inactive sludge lagoon, and from McIntosh and Behm (1967).

Edwards (Balcones Fault Zone) Aquifer

Kelly Air Force Base lies within the limits of the Edwards (Balcones Fault Zone) Aquifer, which is defined as a "sole source" aquifer by the USEPA. In 1959, the Texas Legislature created the Edwards Underground Water District to provide for the systematic planning and protection of subsurface water resources derived from the Edwards Aquifer. Regulatory authority is governed by the Texas Water Code Section II, Chapters 156.20.01.001-.019 and extends into the recharge zone (outcrop area) located north of the reservoir zone.

The area underlain by the Edwards Aquifer sweeps an arc extending from Kinney County to the west, to Hays County on the east aquifer boundary. This area is approximately 175 miles long and varies in width from 5 to 30 miles. The west, north and east aquifer boundaries are defined geologically where hydrogeologic units crop out forming the generally acknowledged recharge zone or where ground-water divides exist. The south aquifer boundary is arbitrarily defined as the "bad water

line" where total dissolved solids concentrations exceed 1,000 milligrams per liter. The aquifer (reservoir) area and its associated recharge zone are presented on Figure 3.7.

The Edwards Aquifer consists of three hydrogeologic units which are known to be hydraulically continuous: the Georgetown Limestone, the Edwards Limestone and the Comanche Peak Limestone. The limestone units are described as being thin to massive-bedded, nodules, cherty, gypseous, argillaceous white to gray limestone and dolomite. The rock is characterized by an extensively honeycombed, cavernous structure created by solution channeling over wide areas.

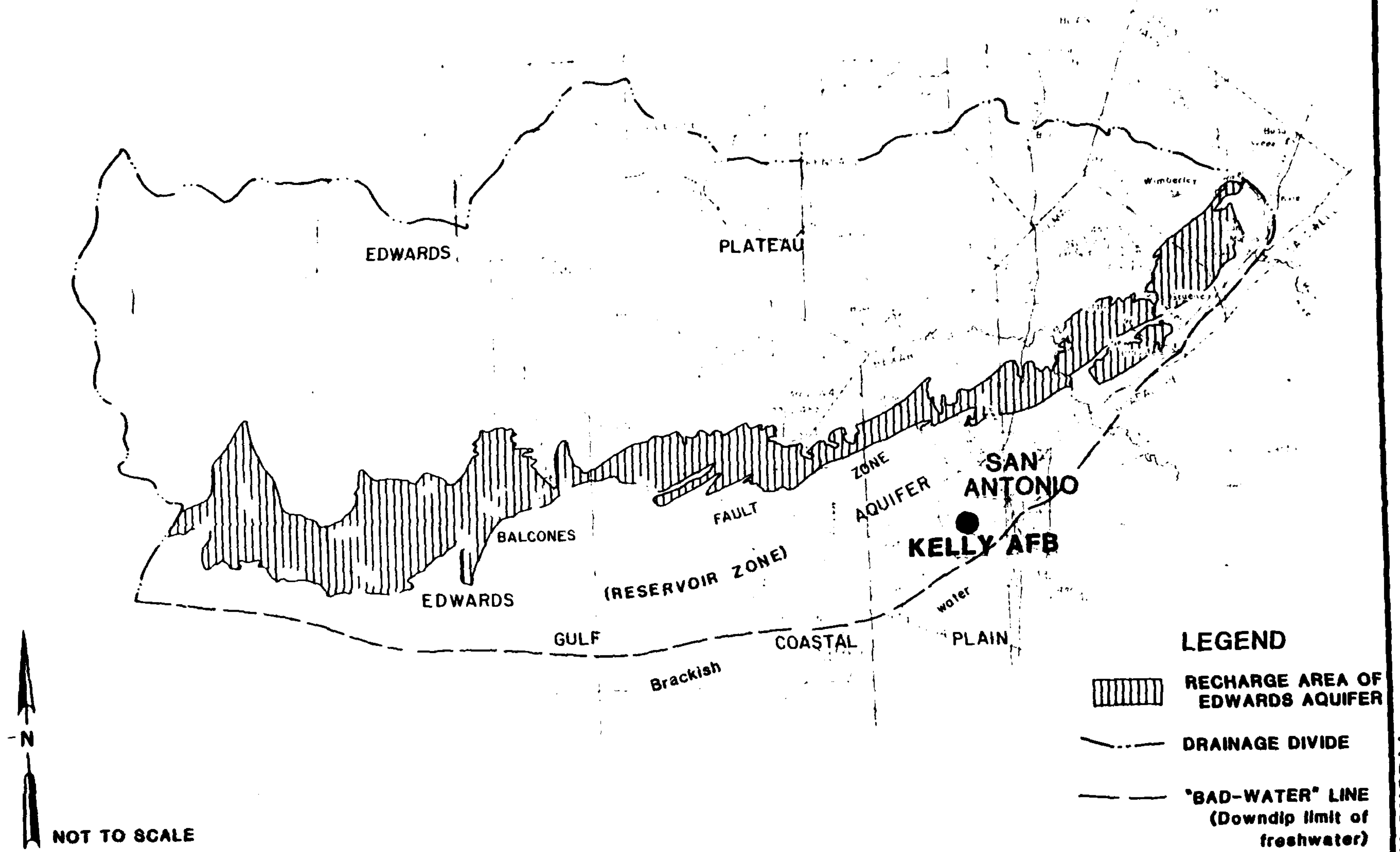
The Edwards Aquifer lies at great depth beneath Kelly Air Force Base ranging from 998 feet at Well I-77 to 1,175 feet at Well I-72. At Lackland AFB, the Edwards lies some 1,490 feet below ground surface. The cross-section depicted in Figure 3.8, illustrates hydrogeologic units encountered at Lackland Well No. 3 which is typical of the study area. This cross-section is the best well log description available. Installation well logs indicate a typical aquifer thickness of 540 feet at Well I-97.

The Edwards Aquifer is confined at its base by the Glen Rose Formation and at its upper surface by the Del Rio Clay or correlative units. Water is contained in the Edwards under confined (pressurized) conditions.

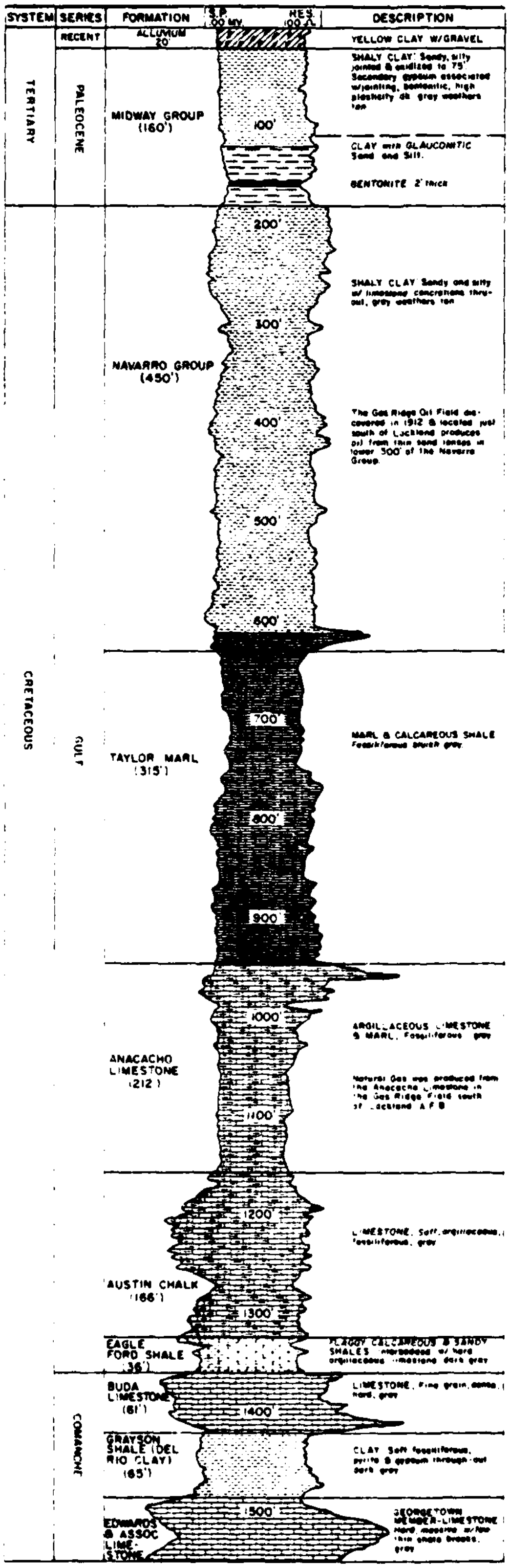
The Edwards is recharged principally by the downward percolation of surface waters from streams traversing the area of outcrop and by precipitation infiltration in this same zone. Figure 3.9 depicts the recharge area in a generalized cross-section. In areas where streams cross the aquifer area of outcrop, numerous large solution channels have been observed (Arnow, 1959). Similar large solution channels have been noted on driller's well logs in the reservoir zone several miles to the south. Once water has entered the Edwards, it moves rapidly downdip (Maclay, 1981) principally in solution channels such as those shown in the hypothetical flow diagram presented as Figure 3.10. Ground-water flow directions are both to the south (downdip along formation gradients) and to the east - northeast paralleling the fault system and according to prevailing hydraulic gradients (Pearson et al, 1975). Figure 3.11 depicts water levels within the Edwards as of July, 1974

FIGURE 3.7

KELLY AFB
EDWARDS AQUIFER AREA



SOURCE: MACLAY et al (1980)

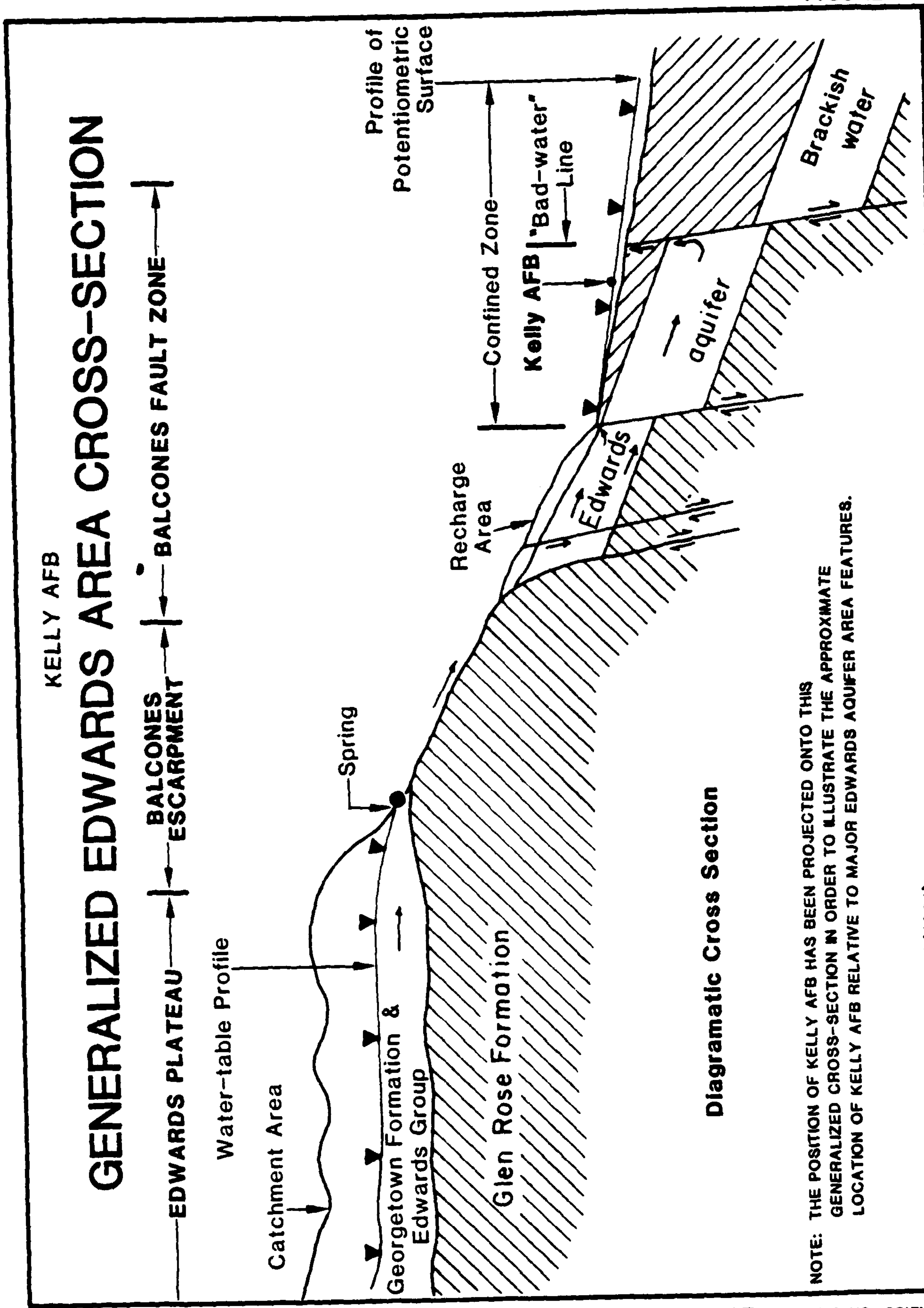


STUDY AREA WELL LOG

Well located at Luke Drive and Military Highway, Lackland, AFB, 4600 feet West of Kelly AFB.

SOURCE: McINTOSH & BEHM (1967)

FIGURE 3.9

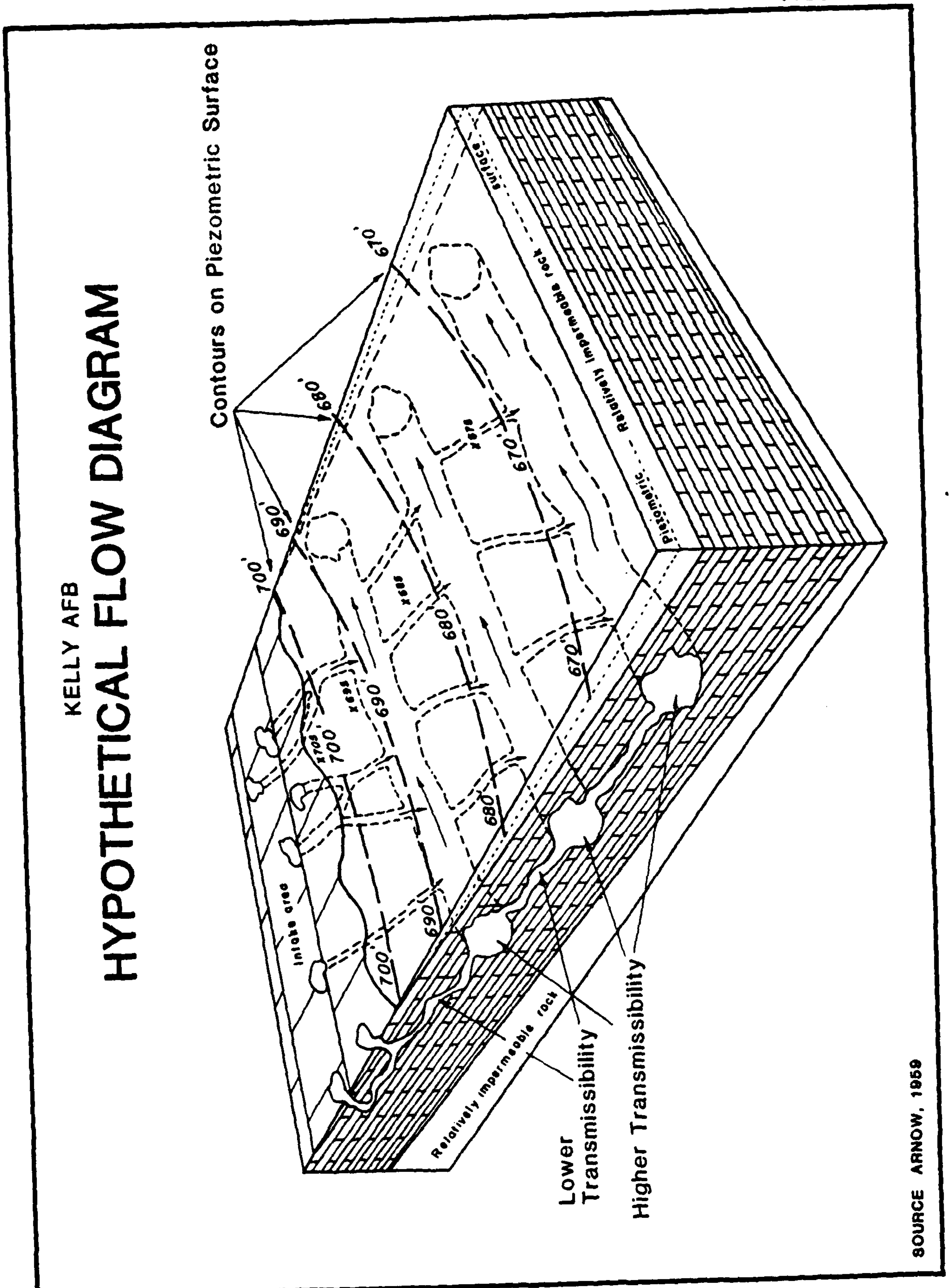


NOTE: THE POSITION OF KELLY AFB HAS BEEN PROJECTED ONTO THIS GENERALIZED CROSS-SECTION IN ORDER TO ILLUSTRATE THE APPROXIMATE LOCATION OF KELLY AFB RELATIVE TO MAJOR EDWARDS AQUIFER AREA FEATURES.

SOURCE: MODIFIED FROM MACLAY et al (1981)

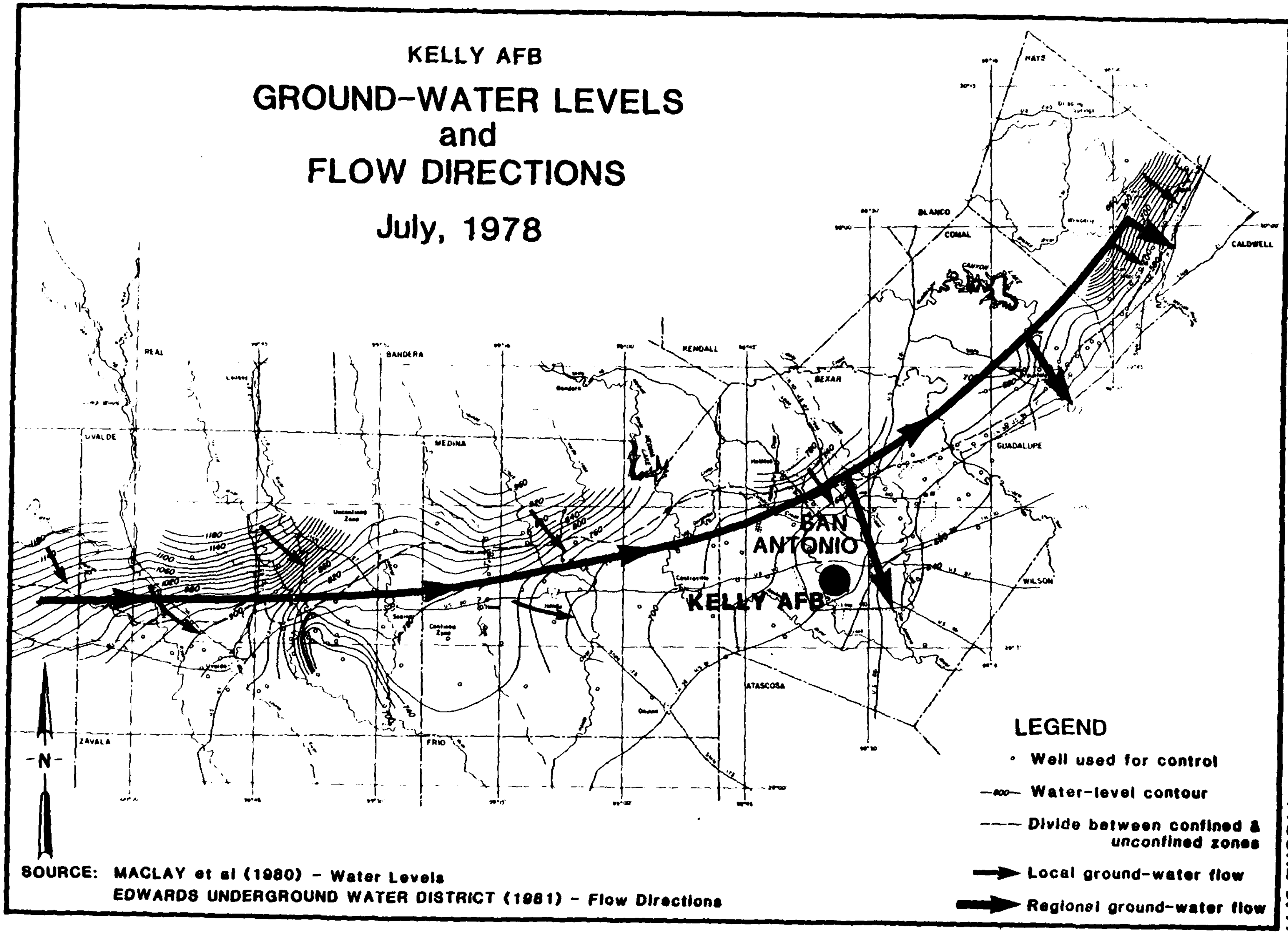
ES ENGINEERING-SCIENCE

FIGURE 3.10



ES ENGINEERING-SCIENCE

FIGURE 3.11



ES ENGINEERING-SCIENCE

with approximate ground-water flow directions. It should be noted here that local variations in flow directions may occur.

The quality of ground water derived from the Edwards has been studied by Reeves (1976), Maclay et al. (1980) and Reeves et al. (1980), among others. Water quality is generally considered to be acceptable in wells sampled north of the "bad water line" shown on Figure 3.7. Because of its highly prolific nature, the Edwards is easily susceptible to contamination in the recharge (outcrop) zone, but not in the reservoir zone where Kelly Air Force Base is located. In the reservoir zone the Edwards Aquifer is tightly confined and under strong artesian pressure.

At present, Kelly Air Force Base draws water supplies from seven base wells, all of which are finished in the Edwards Aquifer. Installation wells have been constructed individually and are not concentrated in a well field. The locations of base wells are presented as Figure 3.12. Base wells presently in service range in finished depth from 1,030 feet (I-78) to 1,677 feet (I-66). Information recorded during the period 1934-1955 indicate that historical water levels averaged 60 feet below land surface. Base water well data is summarized as Table 3.4. Installation water well supplies are generally of good quality, with hardness being the only problem constituent. A sample obtained from Well I-93 indicated a total hardness of 230 milligrams per liter as $CaCO_3$ in an analysis dated 1974 (Tab A-1, Section 3.2.2).

<u>Shallow Aquifer Zones</u>

Coarse-grained alluvium deposited by existing or now abandoned stream channels exists at shallow depths throughout much of the study area. The granular alluvium typically begins at depths in the range of two to ten feet below present land surface and varies in thickness, averaging five feet. Ground water contained in the alluvium may be present at depths below ground surface in the range of five to fifteen feet, and is usually absent below 25 feet. This condition has been interpreted by McIntosh and Behm (1967) to indicate that a perched water table exists in the general study area. The perched water table system is probably recharged directly by precipitation and/or where the granular materials are intersected by the course of Leon Creek. Flow directions, persistence and lateral limits of this perched system are uncertain. It is suggested that shallow aquifer zones adjacent to Leon

FIGURE 3.12

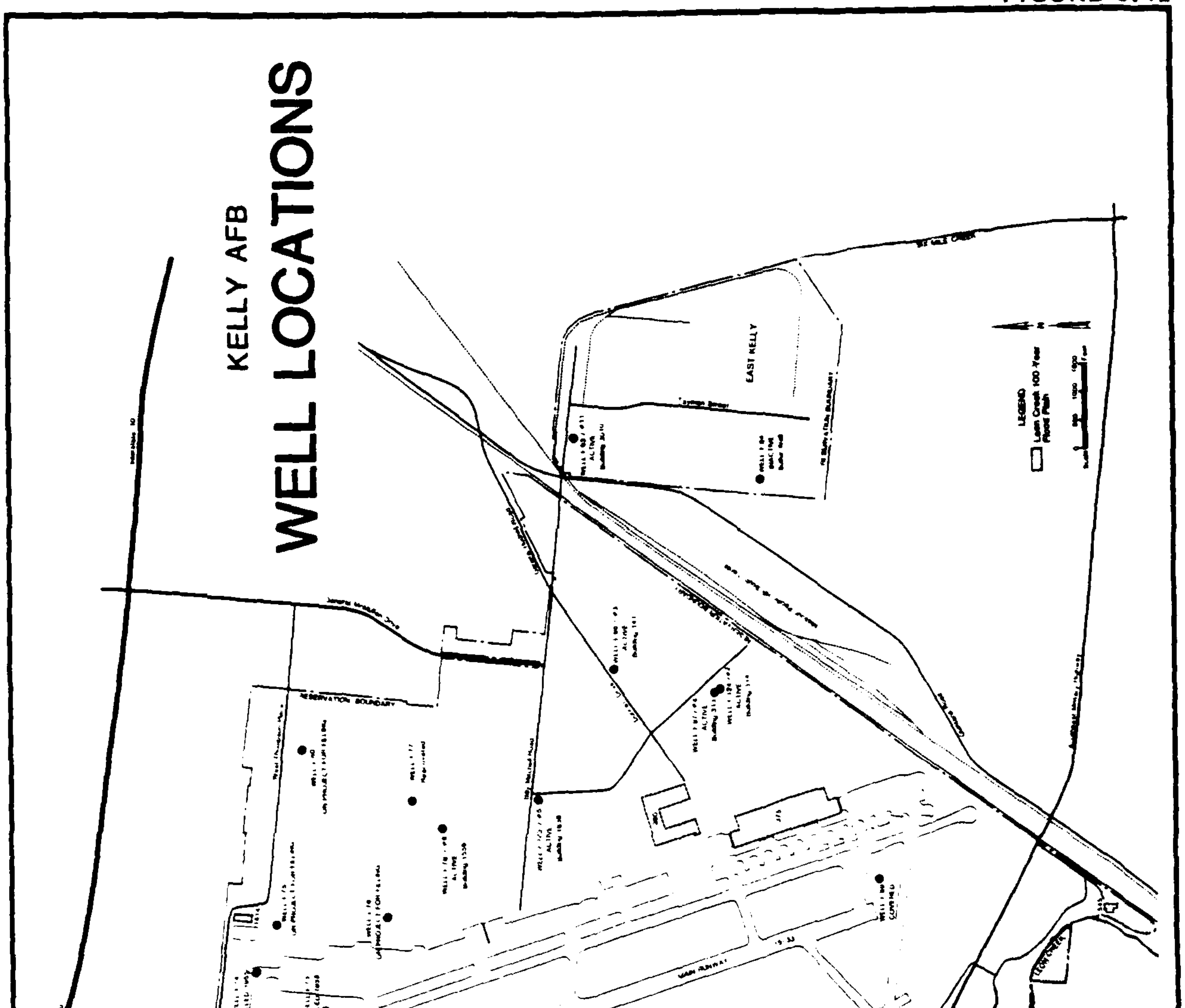

KELLY AFB
WELL LOCATIONS
EAST KELLY
MAIN RUNWAY
RESERVATION BOUNDARY
LEGEND
NOTE: Wells I-75, I-76 and I-80 are closed wells and are scheduled to be filled in the near future.
SOURCE: KELLY AFB INSTALLATION DOCUMENTS

TABLE 3.4

SUMMARY OF BASE WATER WELL DATA*

New Well Number	Old Well Number	Location Building	Diameter (in)	Finished Depth (ft)	Depth to Aquifer, ft	Yield (1978),gpm
7	I-66	B-1044	10	1677	1138	315
6	I-78	B-1556	13 5/8	1030	INA	501
11	I-93	B-3010	12	1120	1090	1657
3	I-96	B-141	10	1400	1040	916
4	I-97	B-313	10	1595	1054	1012
5	I-123	B-1638	18	1632	1067	1012
2	I-124	B-314	16	1608.5	INA	984
-	I-77	NA	9 5/8	1042	1026	INA

* Wells presently in service.
INA = Information Not Available.
NA = Not Applicable. Well located 1.15 miles from N.E. corner of Roselawn Cemetery.

Source: Installation Documents

Creek are recharged during high flow periods and discharge to Leon Creek during dry periods, providing base flow to the stream.

A ground-water quality monitoring program which is being conducted at the Kelly Air Force Base sludge lagoon, adjacent to Leon Creek, has apparently encountered a shallow aquifer at depths below present ground surface ranging from 13.25 feet to 14.16 feet, as measured in four of seven monitoring wells. As well construction information is incomplete, it is not possible to provide further evaluation of the shallow aquifer. Presumably, course-grained alluvium deposited along the breadth of Leon Creek's floodway is the water-bearing stratum and is, therefore, probably in communication with base surface waters, periodically or pereneially. The locations of sludge lagoon monitoring wells are depicted on Figure 3.13.

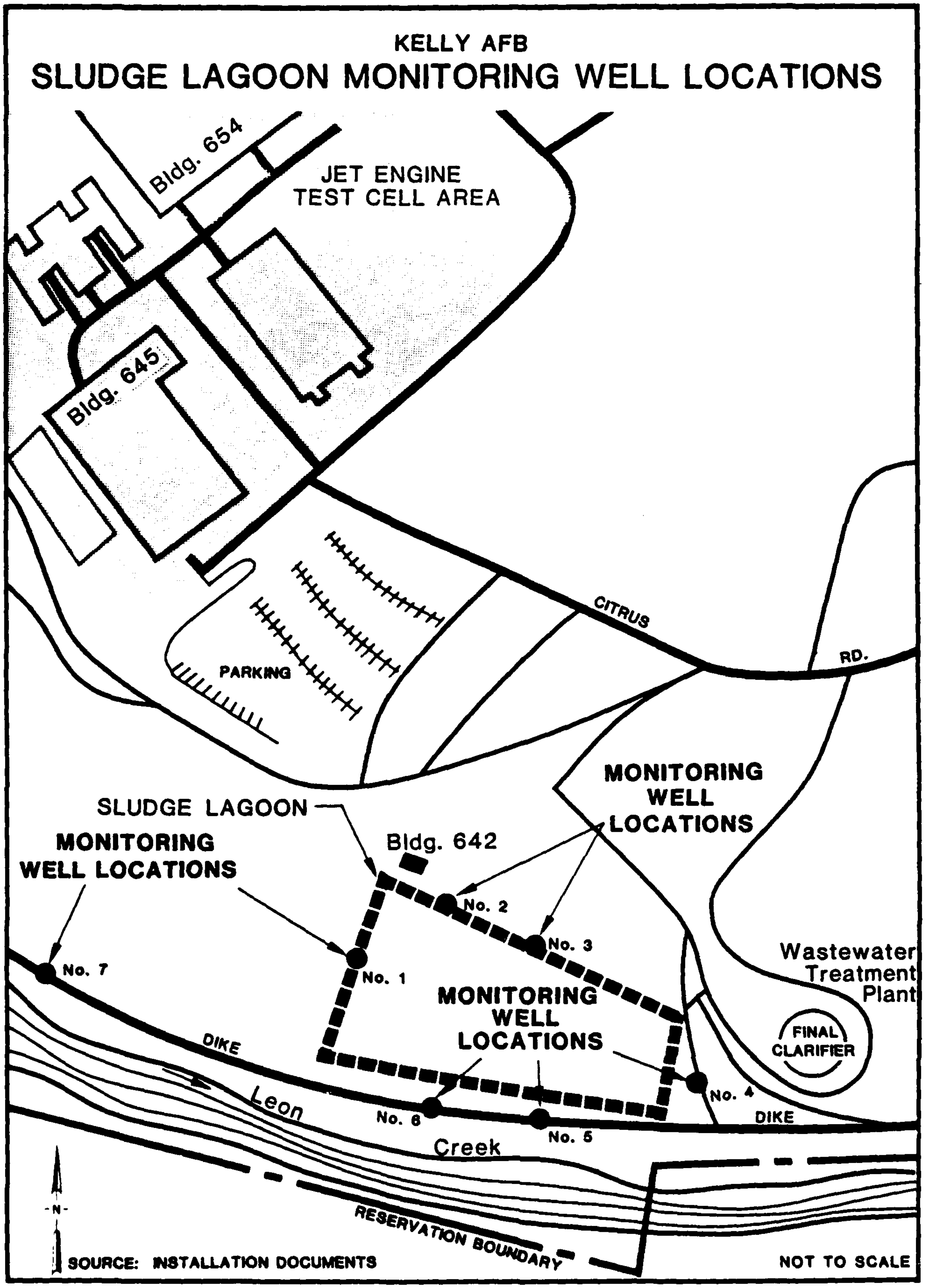
SURFACE WATER QUALITY

The Texas Department of Water Resources has regulatory responsibility for the maintenance of water quality in the Kelly AFB area. The applicable Surface Water Quality Standards for general surface waters and Leon Creek are contained in Appendix C. The Leon Creek segment of the San Antonio River Basin within Kelly AFB is deemed usable for contact recreation, non-contact recreation, propagation of fish and wildlife, and domestic raw water supply by the Texas Water Quality Board.

Kelly AFB has a National Pollutant Discharge Elimination System (NPDES) permit for the discharge from the industrial waste treatment (outfall 001) and for storm water discharges to Leon Creek (002 and 003). The Base Bioenvironmental Engineer obtains monthly 24-hour composite samples from stations 1, 3, 7 and 8 and grab samples from sampling stations 2, 5, 6 and 9 are collected during inclement weather and surface runoff.

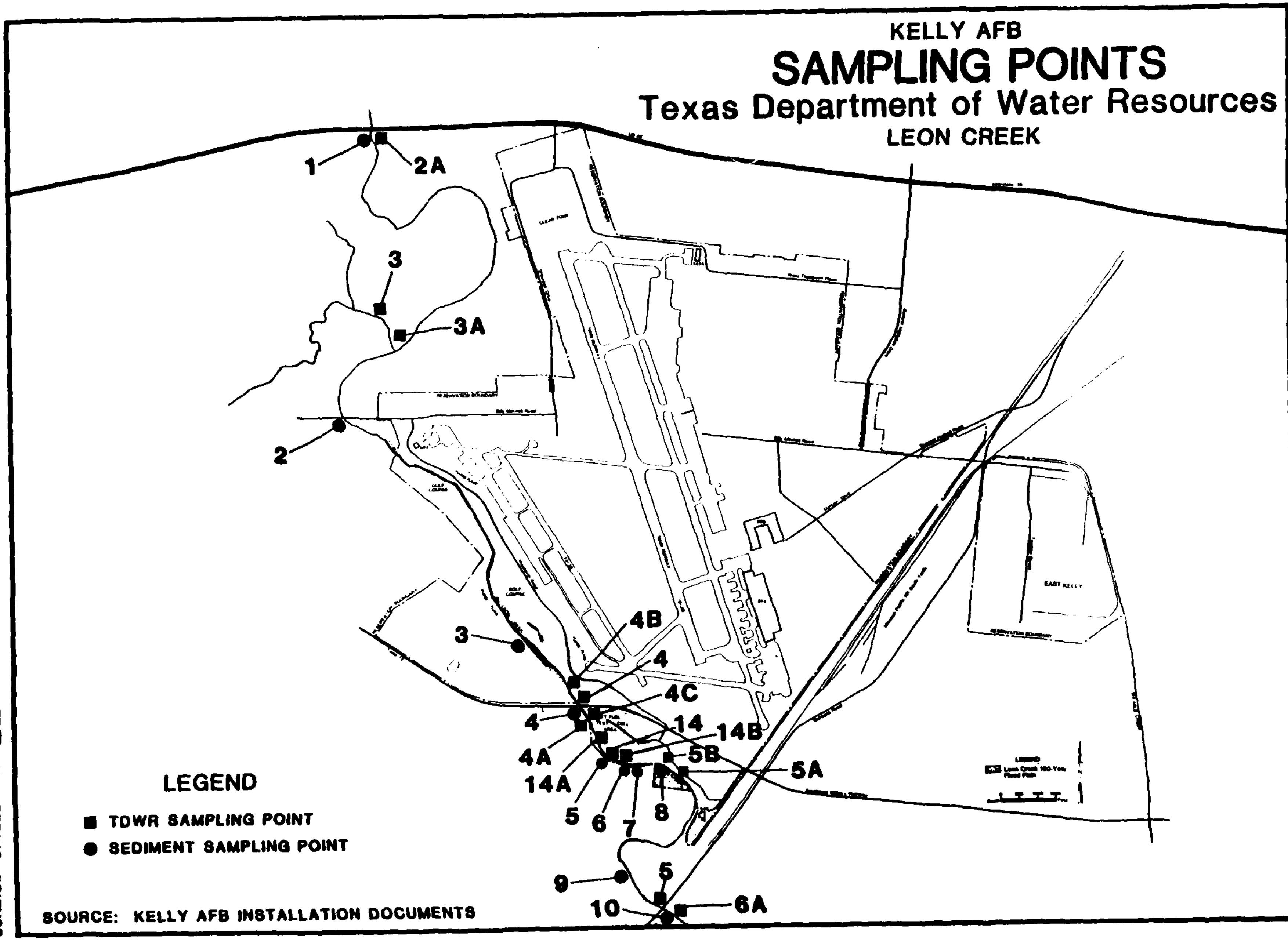
Several surface water monitoring studies have been conducted on Leon Creek at Kelly AFB by the Texas Water Quality Board. These studies have utilized the monitoring points illustrated in Figure 3.14. The studies which were conducted in July 1974, March 12, 1976, November 15-18, 1976, May 10-11, 1979 and January 21, 1980 confirmed the presence of DDT and its degradation products, DDD and DDE, as well as PCB's, in

FIGURE 3.13



ES ENGINEERING-SCIENCE

FIGURE 3.14


KELLY AFB
SAMPLING POINTS
Texas Department of Water Resources
LEON CREEK
1
2A
3
3A
2
3
4B
4
4C
4
14
14B
4A
5B
5A
14A
5
6
7
8
9
5
10
6A
LEGEND
TDWR SAMPLING POINT
SEDIMENT SAMPLING POINT
SOURCE: KELLY AFB INSTALLATION DOCUMENTS

Leon Creek sediment samples. The presence of diethylhexyl phthalate (48 mg/kg) was found in sediment at Station 14 (discharge point 001). However, this compound was detected at only one sample point. In addition, heavy metals concentrations were noted at various sediment sampling locations along Kelly AFB, particularly at Station 14. Sediment pesticide analyses for sampling stations at Kelly AFB on May 10, 1979, are illustrated in Appendix C. Sediment heavy metals analyses at the same stations are illustrated in Appendix C.

ENVIRONMENTAL SUMMARY

Geographic, geologic and hydrologic data evaluated for this study indicate the following:

- The primary regional aquifer, the Edwards, underlies Kelly Air Force Base at great depth (998 feet or deeper).
- Kelly Air Force Base lies within the reservoir area and not the recharge zone of the Edwards Aquifer.
- The Edwards Aquifer functions under artesian conditions and is sealed from ground surface by substantial sequences of clay, marl, sandstone, etc.
- A shallow water table (unconfined) aquifer has been shown to exist on base and is probably in communication with base surface waters (Leon Creek) periodically or perenially. The full extent of this aquifer is unknown.
- Three abandoned wells identified in the area present a potential pathway for waste migration into the Edwards Aquifer by way of deteriorating casing materials.
- Leon Creek traverses Kelly AFB in a north to south direction.
- Base surficial soils are predominantly silts or clays that exhibit characteristically low permeabilities. More permeable, coarser-grained soils are present at ground surface in zones proximate to Leon Creek.
- The Leon Creek sediment analyses have shown heavy metal, pesticide and herbicide contamination within Kelly AFB.
- Annual net evaporation for the area is -30 inches. This condition reduces the amount of leachate generation from landfills located on Kelly AFB resulting from precipitation.

- No wetlands exist within the installation boundary.
- Natural populations of either threatened or endangered plants or animals do not exist on the base.
- A municipal wastewater treatment plant discharges to Leon Creek north of Kelly AFB.
- Two city landfills are located adjacent to Kelly AFB. One landfill is located north of Kelly near Lackland AFB and Leon Creek. The second landfill is located just south of Kelly AFB new Lean Creek.

A strong potential does exist for the generation and migration of waste contaminants into and through the shallow aquifer zone. Wastes disposed in areas adjacent to Leon Creek have been placed in the unsaturated portion of this aquifer. The aquifer is present at shallow depths and is recharged directly by precipitation and/or by communication with Leon Creek. Migrating wastes would reasonably be expected to move through the shallow aquifer and enter Leon Creek as part of the base flow during dry periods.

From these major points it may be concluded that the potential for the generation and subsequent migration of contaminants originating from past waste disposal sites to the deep (Edwards) aquifer is not likely unless migrating wastes encounter an improperly abandoned well and follow deteriorating casing materials downward into the potable water zone (Reeves, 1981). The actual movement of contaminants into an artesian aquifer would be governed by the hydrochemical properties of the individual material.

SECTION 4

FINDINGS

SECTION 4

FINDINGS

To assess hazardous waste management at Kelly AFB, past activities of waste generation and disposal were reviewed. This section contains a summary of the wastes generated by activity, a description of disposal methods used at Kelly AFB, and an identification and evaluation of disposal sites located on the base. Figure 4.1 presents the decision tree utilized in the review of waste practices. This tree provided a logical algorithm for the consistent evaluation of all base practices.

PAST ACTIVITY REVIEW

To determine past activities on the base that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This review consisted of interviews with base employees, a search of files and records, and site inspections.

Potentially hazardous wastes generated on Kelly can be associated with one of the following four activities carried out on base:

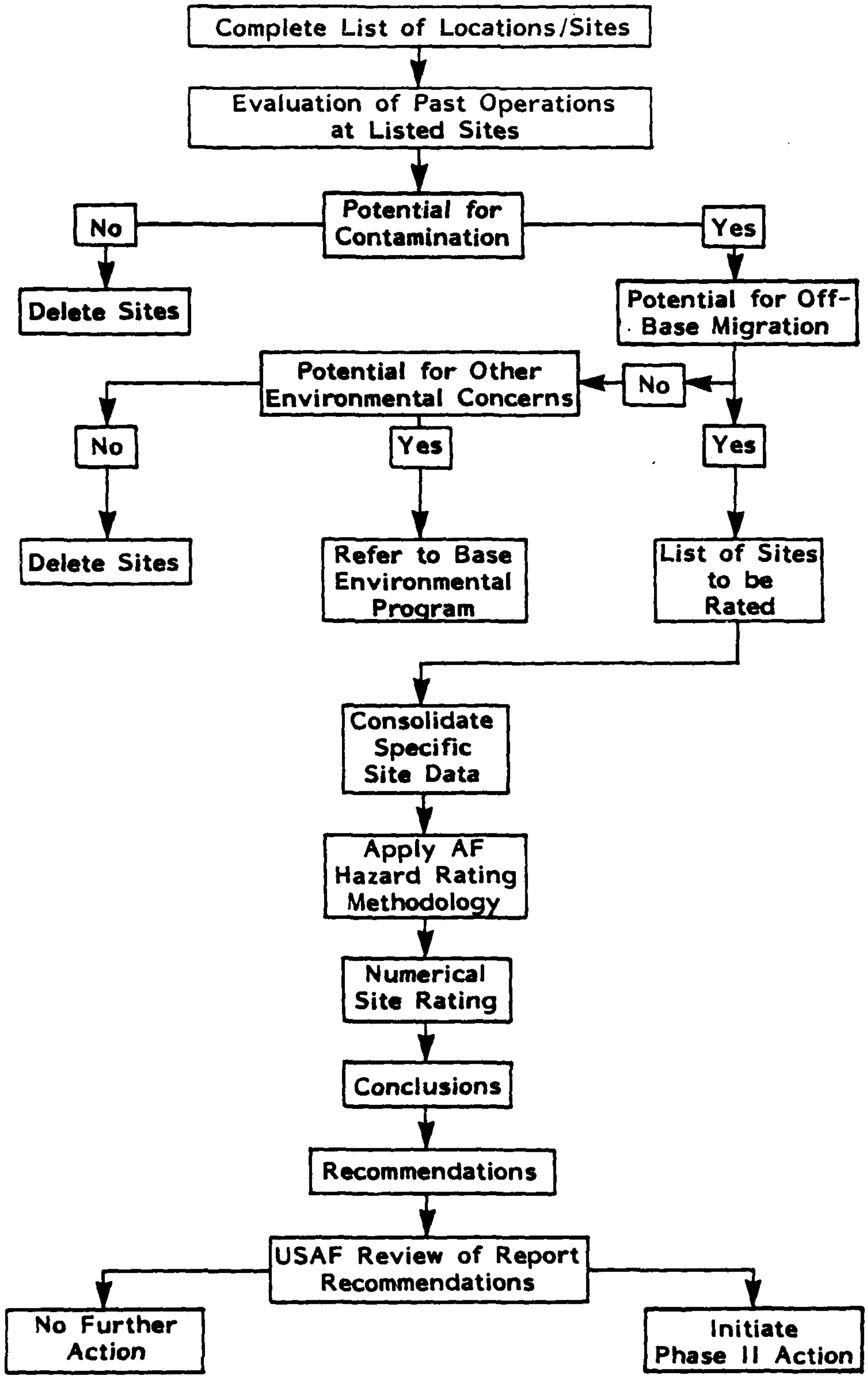
- Industrial Operations (Shops) and Laboratories
- Fuels Management (POL)
- Pesticide Utilization
- Fire Control Training

The following discussion addresses only those wastes generated on base which are either hazardous wastes or potentially hazardous wastes. In this discussion a hazardous waste is defined as hazardous by either the Resource Conservation and Recovery Act (RCRA), or the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). A potentially hazardous waste is one which was suspected of being RCRA hazardous although insufficient data was available to fully characterize the waste.

FIGURE 4.1

PHASE I INSTALLATION RESTORATION PROGRAM

DECISION TREE



Industrial Operations (Shops and Labs)

Major mission support activities are conducted at Kelly AFB by various groups and squadrons through industrial shops and labs. These shops maintain, fabricate and repair components and parts for aircraft and ground equipment. Industrial operations at Kelly can be divided into two major groups as follows: Directorate of Maintenance activities and support facilities for the base or tenant missions. The Directorate of Maintenance provides large facilities for servicing and repairing aircraft such as the C5 and the B52 and engines such as the F-100.

Identification of hazardous material usage and hazardous waste generation in the shops was obtained through file information, past reports, interviews and site visits. A current list of active shops utilizing hazardous materials was obtained from the Bioenvironmental Engineering Office (SGB). An OEHL report #EHL(K) 70-11 entitled "Industrial Wastewater Survey and Performance Specifications for Wastewater Discharges at Kelly AFB, TX" provided additional information on past waste generation and waste disposal practices. A search of the SGB files revealed some additional information on previous locations and materials utilized. It is important to emphasize that much of the shop information was combined into building files. Hence, for the purposes of this project, the buildings are dealt with as an industrial unit. Since the individual shops generally send their wastes to a common location in the building prior to disposal, this practice supported the rationale to discuss the waste disposal practices by industrial buildings.

A master list of active shops by industrial building, previous locations and identification of hazardous waste generated and disposed is provided in Appendix D, Table D.1.

Those shops which generate waste which may pose a potential for contamination of ground waters or surface waters were then selected for review and investigation by shop interviews. A shop was considered to pose a potential for contamination if hazardous materials were handled, hazardous wastes were generated, or the quantity of hazardous waste was significant enough to pose problems if improperly handled. Also, any indication of non-standard hazardous waste disposal proactices at the shop facility were reviewed. Past waste generation and disposal methods

waste item showing the disposal practices and their respective period of operation. The results of this shop review are listed in Table 4.1. However, several shops which may generate hazardous waste were eliminated from Table 4.1 due to insignificant waste quantities. Table 4.1 indicates the shop building location, the hazardous material utilized, the hazardous waste quantity disposed, and the disposal methods on a time line. For the time line information, the solid line indicates confirmed time frame data by base personnel while the dotted line indicates unconfirmed time frame information obtained from base personnel or records.

A shop facility was considered to pose a potential for migration to ground waters or surface waters if past hazardous material usage, waste storage or shop site disposal practices may have provided a pathway for contamination migration. In most cases, any potential contamination problems related to hazardous wastes generated within the shops are related to storage, treatment or disposal once the materials leave the shop area. For instance, drummed wastes are currently delivered to the Industrial Waste Treatment plant for shipment to an outside contractor for disposal or through DPDO for reclamation. Dilute wastes are processed through the Industrial Waste Treatment plant at Kelly AFB prior to discharge to Leon Creek. Concentrated acid wastes and metal bearing wastes are batch treated at the waste treatment plant. In the past, prior to 1970, drummed wastes, sludges and general shop refuse were disposed at various landfill locations on Kelly AFB. Since 1970 all solid waste disposal has been sent off site for contract disposal.

Appendix E contains a site location map for those areas of Kelly AFB which contain potential site contamination. In the final analysis, the shops discussed herein are considered low priority sites with regard to Phase II recommendations. The only past sites which potentially may be of concern are located at Building 1414 and Buildings 258 and 259. Building 1414 (Site IS-1) served as a reclamation operation for solvent recovery (trichlorethylene) from 1955-1972. During its operation minor amounts of solvent spilled into a ditch area on the northeast side of Building 1414. The extent of solvent spillage in this area is not

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
MAT				
SPECIAL WEAPONS	1420	MIXTURE WASTE PAINT NAPTHA TOLUENE METHYL ETHYL KETONE XYLENE THINNER STRIPPER	55 GALS./MO.	DRUMMED → DPDO
		HYDRAULIC OIL PD 680 TYPE II	65 GALS./YR.	DRUMMED → DPDO
MAE				
PLATING FACILITY	301	RINSE WATER	20,000 GALS/DAY	IWS → IWTP
		RINSE WATER	5,500 GALS/DAY	→ SANITARY SEWER
		PLATING BATHS (SILVER, COPPER, CADMIUM, CHROME AND NICKEL)	CHANGED AS NEEDED	DRUMMED, DEMPSTER → IWTP
		SILVER BATH SLUDGE	CHANGED AS NEEDED	DRUMMED → NAVY RECYCLE
		OTHER PLATING SLUDGE	CHANGED AS NEEDED	DRUMMED ON SITE LANDFILLS, DRUMMED → CONTRACT BURIAL
		CHROMIC & NITRIC ACID LAB WASTES	105,000 GALS./MO.	TANKER → IWTP
		WEAK CYANIDE	185,000 GALS./MO.	TANKER → IWTP
		STRONG CYANIDE	4,000 GALS./MO.	DEMPSTER → IWTP

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

MAT: TECHNOLOGY REPAIR AND INDUSTRIAL PRODUCTS DIVISION

R&M: REDISTRIBUTION & MARKETING

MAE: ENGINE DIVISION

IWS: INDUSTRIAL WASTE SEWER

IWTP: INDUSTRIAL WASTE TREATMENT PLANT

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

NOTE: Material sent to DPDO will either be recycled or disposed of as waste. The designation of the waste, hazardous or non-hazardous, will be determined by DPDO in accordance with RCRA.

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
MAE (CONTINUED)				
PLATING FACILITY (CONTINUED)		ALKALI	10,000 GALS./MO.	DEMPSTER → IWTP
MAB				
C5 PAINT HANGER	365	MEK		
		SOLVENT (PD680)	10 DRUMS/MO.	ON-SITE LANDFILL DRUMMED → CONTRACT DISPOSAL
		PAINT REMOVER	130 DRUMS/MO. (5460 GALS./MO.)	SANITARY SEWER
B52 & C5 MAINTENANCE & PAINT FACILITY	375	FIRE EXTINGUISHER CHEMICALS	INA	
		MEK		DRUMMED TO R&M DPDO
		TOLUENE		DRUMMED TO R&M DPDO
		NAPTHA		DRUMMED TO R&M DPDO
		CORROSION REMOVER		DRUMMED TO R&M DPDO
		SOLVENTS PD680 PD6852		DRUMMED → DPDO
		PAINT RESIDUES		
		PAINT THINNERS		
		PAINT REMOVERS		SANITARY SEWER
		CARBON REMOVER		DRUMMED TO R&M DPDO
		PERCHLOROETHYLENE		DRUMMED TO R&M DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

IWTP: INDUSTRIAL WASTE TREATMENT PLANT

MAB: AIRCRAFT DIVISION

R&M: REDISTRIBUTION & MARKETING

INA: INFORMATION NOT AVAILABLE

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
MAB (CONTINUED)				
B52 & C5 MAINTENANCE & PAINT FACILITY (CONTINUED)	375	TRICHLOROETHYLENE	INA	
		WASTE OILS		DPDO
		WASTE FUELS		DPDO
PAINT STRIPPING & WASH RACK	385	PAINT STRIPPERS	140 DRUMS/MO.	SANITARY SEWER
		CORROSION REMOVER		
		DEGREASERS		
MAT/MAB				
PLASTIC UNIT	522	TRICHLOROETHYLENE		FACILITY NOT USED
		ACETONE		
RADOM PAINT STRIPPING		MEK		
		TOLUENE		
MAE				
HEAT TREATMENT	324	PERCHLOROETHYLENE	2 DRUMS/MO.	DPDO
		LIQUID HEAT SALTS	VERY SELDOM CHANGED	IWS IWTP
		OIL QUENCH		
		FLUIDIZDED BED (SAND)		

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

INA: INFORMATION NOT AVAILABLE

R&M: REDISTRIBUTION & MARKETING

IWS: INDUSTRIAL WASTE SEWER

IWTP: INDUSTRIAL WASTE TREATMENT PLANT

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
MAE (CONTINUED)				
ENGINE REPAIR	360	PERCHLOROETHYLENE	INA	
		SOLVENT (PD680)		
		TRIM 50 & 50		
		TRICHLOROETHANE		
		METHYL ETHYL KETONE		
		SOLVENT (EXXON 680)		
		PENETRANT		DRUMMED → CONTRACT LANDFILL OR DPDO
		TOLUENE		
		PAINT STRIPPERS		
		HYDROCHLORIC ACID		
		WASTE OILS		
		PAINT THINNER		
ENGINE TEST SECTION	645	METHYL ETHYL KETONE	5 GALS./MO.	EVAPORATION
		SOLVENT (PD680)	200 GALS./MO.	DRUMMED → DPDO
		WASTE OILS	100 GALS./MO.	DRUMMED → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

INA: INFORMATION NOT AVAILABLE

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
MAT				
ELECTRONICS REPAIR	308	TETRACHLOROETHYLENE	220 GALS./MO.	DRUMMED → DPDO
		TRICHOLROETHANE	20 GALS./MO.	DRUMMED → DPDO
		DAMPING FLUID	30 GALS./MO.	DRUMMED → DPDO
AIR CONDITIONERS/COMPRESSORS REPAIR	312	TRICHLOROETHANE TRICHOLROMONOFLUOROMETHANE	INA	INA
		CARBON REMOVER		
		WASTE PAINT		
		WASTE OILS	3 DRUMS/MO.	DRUMMED → DPDO
FUEL ACCESSORIES OVERHAUL	323	PD680	55 GALS./MO.	DRUMMED → DPDO
MACHINE SHOPS	324	WASTE OILS	UNKNOWN (SMALL QUANTITY)	DRUMMED → CONTRACT DISPOSAL
		PERCHOLROETHYLENE		RECYCLED → DPDO →
		SOLVENT (PD680)		DPDO →
		TRIM 50 & 50		DPDO →

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

------ ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

INA: INFORMATION NOT AVAILABLE

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
MAT (CONTINUED)				
BEARING SHOP	326	EMULSIFIER	4 DRUMS/YR.	DRUMMED → DPDO
		PENETRANTS	2 DRUMS/YR.	DRUMMED → DPDO
		CARBON REMOVER	2 DRUMS/YR.	DRUMMED → DPDO
STARTER & GTE DISASSEMBLY	329	PERCHLOROETHYLENE		RECYCLED → DPDO
		CARBON REMOVER		IWTP → DPDO
		SOLVENT		IWTP → DPDO
		CORROSION REMOVER		IWTP → DPDO
		METHYL ETHYL KETONE	EVAPORATED	
		TRICHLOROETHANE	EVAPORATED	
		TURCO		
		WASTE OILS		
		BATTERY ACIDS		IWTP
HYDRAULIC BEARING SECTION	333	ALCOHOL	4 DRUMS/MO.	DRUMMED → DPDO
		PERCHLOROETHYLENE	3 DRUMS/MO.	DRUMMED → DPDO
		WASTE OILS	4 DRUMS/MO.	DRUMMED → DPDO
		PD 680	2 DRUMS/MO.	DRUMMED → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

IWTP: INDUSTRIAL WASTE TREATMENT PLANT

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY*	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
MAT (CONTINUED)				
FUEL ACCESSORIES	347	SOLVENT (PD 680)	4 DRUMS/MO.	DRUMMED → DPDO
		CALIBRATING FLUID	75 DRUMS/MO.	DRUMMED → IWTP
PNEUDRAULICS ACCESSORIES	348	TURCO STRIPPER		DRUMMED DPDO →
		CALIBRATING FLUID		
		CHROMIC (ACID) TRIOXIDE		HOLDING PONDS DPDO →
		CORROSION REMOVER	2,000 GALS/MO.	HOLDING TANK → IWTP
		PERCHLOROETHYLENE	600 GALS/MO.	HOLDING TANK → IWTP
		FREON CLEANING (COMP. SOLV.)		
		PD 680	6 DRUMS/MO.	DRUMMED → DPDO
TPM				
GENERAL VEHICLE MAINTENANCE (CONTRACTOR RUN)	53 50 38 49	DEGREASERS		DRUMMED → DPDO
		WASTE OIL		DRUMMED → DPDO
		BATTERY ACID	48 GALS./MO.	NEUTRALIZED SANITARY SEWER →
		SOAP	20 LBS./MO.	SANITARY SEWER → CITY
		ALKALINE CLEANER	48 GALS/MO.	SANITARY SEWER → CITY

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

INA: INFORMATION NOT AVAILABLE

IWTP: INDUSTRIAL WASTE TREATMENT PLANT

*BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

considered a problem in terms of current potential for contaminant migration off the base.

Buildings 258 and 259 housed electroplating operations which currently are conducted in Building 301. Buildings 258 and 259 were demolished in 1981. The electroplating tank materials were cleaned out and neutralized and the site was filled in with rubble and fill material. The site is not considered a potential problem with respect to contaminant migration.

Fuels Management

The Kelly Air Force Base fuels management storage system consists of numerous underground and above ground storage tanks at various locations throughout the base as identified in the Kelly Air Force Base Spill Prevention Control and Countermeasures Plan. The fuels handled include JP-3, JP-4, and JP-5, Avgas, Mogas, Avlub, solvents, white gas, and waste POL. In addition to the storage tanks, there is an underground refueling/defueling system in the 300 area. Table 4.2 summarizes information pertaining to the fuels storage tanks.

All above ground fuel storage tanks are diked. These tanks are inspected once per year for leaks. The below ground fuel storage tanks are checked for leaks by monitoring the amount of fuel entering and leaving the storage tank. If these two measurements differ by more than 0.5 percent on a monthly basis, then the tank is isolated. If the level in the isolated tank is observed to decline more than 1/8" per day, then the tank will be taken out of service, cleaned out and inspected. If a hole or crack is found that can be repaired, then the tank will be repaired, otherwise the tank will be abandoned. Tanks have been abandoned because of holes or leaks in System 38, 330 (5 tanks), 332 (3 tanks), and 654 (2 tanks). The amount of fuel which leaked from these storage areas is unknown.

Before a tank is inspected it is cleaned manually. Since the early 1970's, the sludges and residues obtained from the tank cleanings have been deposited in the Chemical Evaporation Pit (Site E-3) near the Industrial Waste Treatment Facility (IWTF). Before this time the sludges were hauled to a site that was across Leon Creek from Building 522 (Site S-1). The quantity of sludge deposited at each site is not known because the number and size of tanks cleaned varied each year.

TABLE 4.2

KELLY AFB FUEL STORAGE TANK SCHEDULE

SYSTEM NUMBER	TYPE OF FUEL	NUMBER OF TANKS	NUMBER OF TANKS IN SERVICE	CAPACITY IN GALLONS	REASON FOR ABANDONING
38	Spec. Fuel	2	2	5,000 ea	Hole in Tank
		1	0	10,000	(prior to '71)
	Mogas	2	2	25,000 ea	
	White gas	1	1	500	
182	Avlub, Mogas	5	0	5,000 ea	Abandoned
	& solvents	3	3	10,000 ea	prior to 1971
330	Avlub & solvents	5	0	12,000 ea	Abandoned before 1971
332	Avgas & solvents	4	1	23,500	Three tanks with holes
364	Avlub	3	3	3,000 ea	
		1	1	5,000	
367	JP-3,JP-4,JP-5	4	4	50,000 ea	
	slop tank	1	1	2,000	
371	JP-4	5	5	23,000 ea	
386	Solvents	1	1	10,000	
391	Solvents	7	0	5,000 ea	Tanks not presently in use, but usable
354	Avgas & JP-4	12	8	25,000 ea 5,000 ea	Only 2 of 4 down tanks had leaks
930	115/145	1	0	210,000	Tank demolished due to ventilation problems
960	JP-4	6	6	25,000 ea	
1504	Mogas	1	1	12,000	Abandoned 10/81
1617	Used POL	8	8	25,000 ea	
	-	2	0	10,000 ea	
1592	JP-4	2	2	420,000 ea	
	Slop tank	1	1	2,000	
	Slop tank	1	1	500	

Fuel Spills

Based on available records and conversations with personnel at Kelly Air Force Base, there has been only one major spill associated with the above ground storage tanks (see Appendix E). This occurred inside the diked area around Tank 930 (Site S-6) in the mid-1960's. Based on personnel interviews this spill consisted of approximately 200,000 gallons of leaded fuel. The facility was properly diked and most of the fuel was recovered. An unknown quantity of fuel percolated into the ground because the diked area was not lined. Since that time, Tank 930 has been taken out of service and demolished because the ventilation system did not meet regulations.

Another major spill occurred in the pipe rack near Building 652 (Site SA-3) in 1980. The amount of JP-4 fuel spilled was estimated to be approximately 5,000 gallons. Most of the fuel was contained and recovered. An unknown portion of the amount spilled flowed into a slough and into Leon Creek. Since this site (SA-3) is also a sludge spreading location a potential for migration of contaminants exists as will be illustrated in subsequent sections.

A third major spill occurred last year in the underground fuel system near Building 367 (Site S-4). The amount of fuel lost was approximately 9,000 gallons. The leak is being investigated but has not been located and corrected. However, the system has been taken out of operation. Due to the nature of the geologic setting of this site, the fuel oil is probably located in the alluvial stratum and presents a potential for contaminant migration to Leon Creek.

Other Spills

Other spills, such as spills on the flight line, are washed away by water or AFFF. This activity is generally performed by the fire department. Minor spills (less than 100 gallons) which are not on the flight line are contained with sand. The waste materials have been deposited in the area east of Building 1592 (Site S-1).

Contamination around the aqua pressure fuel tanks has occurred whenever water, used to displace the fuel in the tanks, was discharged to the surrounding area. The water was contaminated because additives such as icing inhibitors present in the fuel became soluble in the water. Tank systems 332 (1 tank presently) and 654 (8 tanks presently)

have been the only systems which utilize the aqua pressure discharge system. In the mid-1970's, a trap was installed for Tank System 654. The contaminated materials which were less dense than water were pumped to the Chemical Evaporation Pit (Site E-3). Water containing soluble materials was discharged to the slough which flowed into Leon Creek. Before the mid-1970's, the total stream was discharged to the slough. The potential for contamination from this area is considered minor.

Pesticide Utilization

Pesticides have been used on Kelly AFB to maintain control of pest infestations and ground foliage, respectively. Historical pest management practices and usage rate documentation were not available (except for recent years). However, through personnel interviews with the entomology section, grounds section and pest management personnel, historical pesticide application and waste disposal practices were reviewed. Table 4.3 illustrates the common pesticides which have been used in the recent past as well as the container disposal procedures.

Recent storage and disposal practices appear to have been well managed and no pollution cases or potential contamination problems can be associated with these practices at Kelly AFB. However, in the 1950's and 1960's, outdated Entomology Section pesticides and empty containers were disposed at various landfill sites located in what is presently the golf course area along Leon Creek. Anything utilized during this time frame, including DDT and Chlordane, were probably disposed in small quantities at landfill Site Nos. D-3, D-4, D-5, D-6 and D-7. This waste material, as well as other hazardous materials disposed at these sites, presents a potential source of contaminant migration to Leon Creek. Until 1981, 15-20 overpack DDT drums were stored in a covered building at the East Kelly Defense Property Disposal Office (DPDO) (Site S-2) with concrete floors. No potential for contaminant migration has been created by this storage area.

Fire Control Training

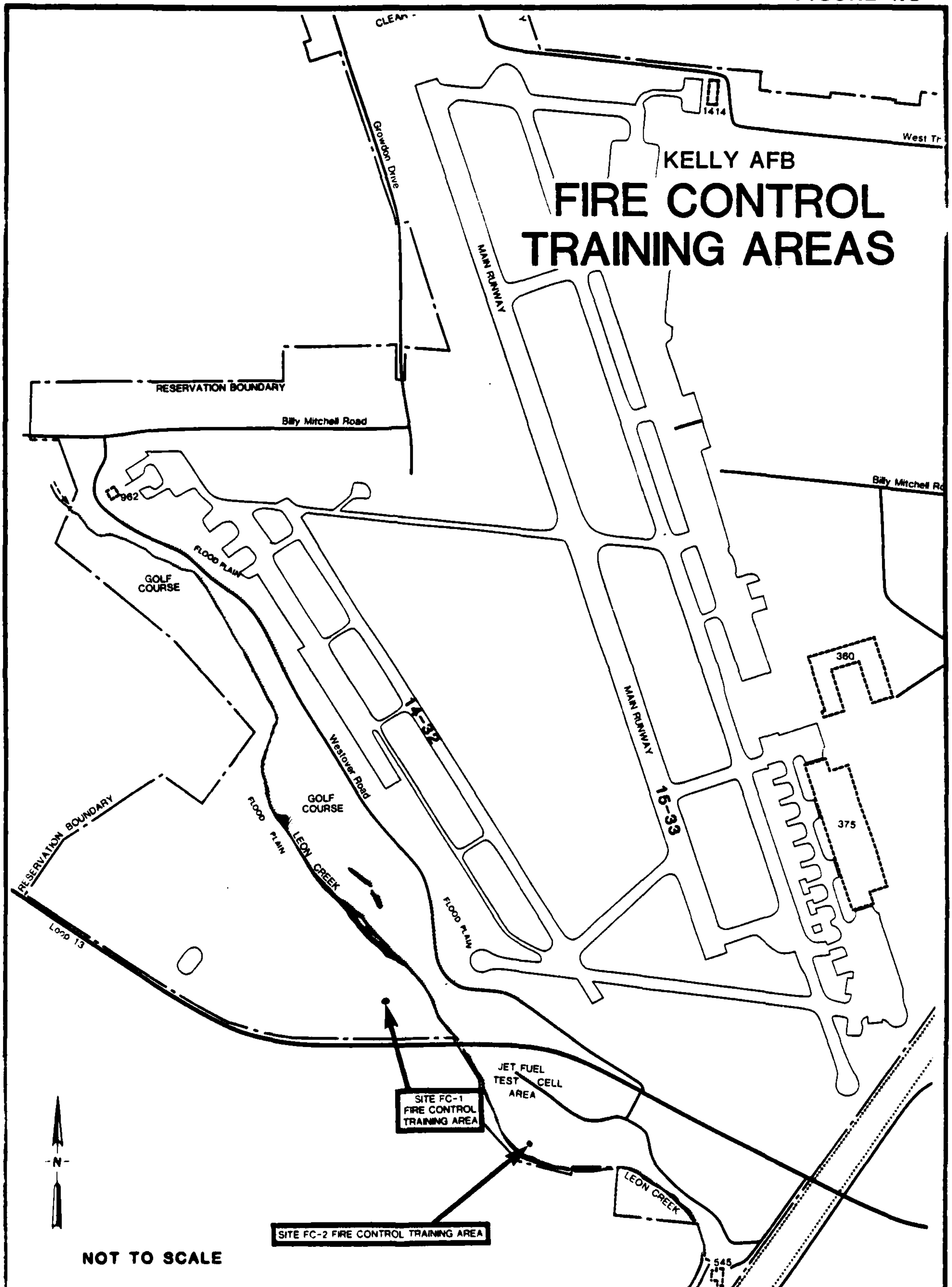
The Kelly Air Force Base Fire Department has performed fire control training (FCT) activities in the area northwest of the industrial waste sludge lagoon (Site FC-2) since the 1950's (see Figure 4.2). Before this time, the FCT site (Site FC-1) was west of Leon Creek and north of

TABLE 4.3

RECENT PAST PESTICIDE USAGE AT KELLY AFB

Material Used	Storage Location	Waste Material	Waste Disposal
PESTICIDES			
Mirek 150	Building S-58-B	Empty small containers	Landfill
Chlordane	Building S-58-B	Empty small containers	Landfill
Malathion	Building S-58-B	Empty small containers	Landfill
Durs Ban M	Building S-58-B	Empty small containers	Landfill
Diazinon 4-E	Building S-58-B	Empty small containers	Landfill
Baytex	Building S-58-B	Empty small containers	Landfill
Lintex	Building S-58-B	Empty small containers	Landfill
Dibrom 14	Building S-58-B	Empty small containers	Landfill
Banuel-D 4-S	Building S-58-B	Empty small containers	Landfill
Resmethrin Aerosol	Building S-58-B	Empty small containers	Landfill
Adjuvant Spray Additive	Building S-58-B	Empty small containers	Landfill
Toxaphene GE	Building S-58-B	Empty small containers	Landfill
Trithion 4E	Building S-58-B	Empty small containers	Landfill
Formaldehyde	Building S-58-B	Empty small containers	Landfill
Phrethrin Aerosol	Building S-58-B	Empty small containers	Landfill
Rodenticidal Anticoagulant	Building S-58-B	Empty small containers	Landfill
Sevin 80%	Building S-58-B	Empty small containers	Landfill
HERBICIDES			
Casoron G-4	Building 90-P	Empty small containers	Landfill
Eptam 5-G	Building 90-P	Empty small containers	Landfill
Ureabor	Building 90-P	Empty small containers	Landfill
Dacthal W-75	Building 90-P	Empty small containers	Landfill
Dow Don	Building 90-P	Empty small containers	Landfill
Phytar 560	Building 90-P	Empty small containers	Landfill

FIGURE 4.2



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

Military Highway where the golf course is presently located (see Figure 4.2). The present facility, which is located about 50 to 100 feet from Leon Creek, has been undergoing modifications for the past year and should be back in operation by November 1981. The existing facility site is located on a flat site which consists of alluvial sands, soils and gravel.

The fire control training procedure has not changed significantly since the 1950's. The procedure is to wet down an area in order to prevent the fire from spreading. Next, fuel is applied over the fuselage and ignited. After ignition, the fire extinguishing agent is applied until the fire has been extinguished.

There have been numerous fire extinguishing agents used for the fire control training activities. Prior to 1948, water was the primary fire extinguishing agent. From 1948 to 1966, the extinguishing agent used was a mixture of water and protein made from animal fat. This solution contained approximately 5 parts water to 1 part protein. The amount of protein used per (FCT) activity was approximately 100 gallons. Since 1966, an aqueous film forming foam (AFFF) has been used as the fire extinguishing agent. Other fire control agents such as water and bicarbonate of soda have been used at times.

The amount of AFFF fire extinguishing agent used is approximately 1000-1500 gallons per year based on two training sessions per year. The ultimate BOD of AFFF (FC-780B, manufactured by 3M) is 370,000 mg/l in concentrated form. The ultimate BOD of other agents such as FC-780 is 314,000 mg/l. Typically, this material is applied at dilutions of 10 percent.

The amount and type of fuel burned has changed since the 1950's. Before the early 1970's, the fuel used was a mixture of waste oils and lubricants and contaminated fuels. The type of fuel burned depended on what was available. Approximately 500 to 1000 gallons of fuel were applied to the site for each FCT session. Since the early 1970's when guidelines establishing the type of fuel were implemented, no more than 10 percent of the amount of fuel burned was composed of waste POL. Most of the time JP-4 was used as the fuel. Because 90 percent of the fuel burned has been JP-4, the amount of fuel burned per training activity has decreased from approximately 500 to 1000 gallons to 200-600 gallons.

Prior to the 1970's, approximately four FCT sessions were held each year. From the early 1970's to the present, at least two FCT sessions were held each year. The number depended on the amount of training required. The potential for migration of fuel contaminants from both FCT sites exists due to their proximity to Leon Creek.

WASTE STORAGE AND DISPOSAL OPERATIONS

The on-site facilities which have been used for management of solid and liquid wastes at Kelly Air Force Base can be categorized as follows:

- DPDO Storage
- Hazardous Waste Storage
- Chemical Evaporation Pits
- Landfills
- Radioactive Waste Disposal
- Wastewater Treatment System
  - Storm sewers
  - Industrial sewers
  - Oil/water separators
  - Septic tanks
- Sludge Landspreading Areas
- Liquid Waste Incinerator

The types of waste management facilities are discussed individually herein.

Defense Property Disposal Office (DPDO)

Waste POL, purging fluids, JP-4, hydraulic fluids, penetrants, transformers, unused hazardous materials and/or wastes (cleaning compounds, DDT, carbon removal compounds, etc.) are typical of the types of materials handled through DPDO in the past. Materials of concern at Kelly AFB DPDO from a handling, storage and ultimate disposal standpoint include the following:

- Off-specification/excess hazardous materials
- Waste oils/solvents (synthetic oils, mineral oils, jet fuel, halogenated and non-halogenated solvents)
- PCB transformers
- Carbon remover compounds (orthodichlorobenzene)

Prior to 1973 the DPDO operation was located in the 1500 area of north Kelly (Site S-1). Since 1973 the DPDO operation has been at East Kelly (Site S-2). Both DPDO storage areas are illustrated in Figure 4.3.

Site S-1 Old DPDO Storage Area

During the 1960's to 1973, carbon cleaning compounds (orthodichlorobenzene) and waste POL were stored in above ground tanks in the 1500 area. Contractors picked up the carbon cleaning compounds at these tanks for off-site recovery. Based on personnel interviews, the tanks often overflowed and drained to a depression area near the tanks. This area (Site S-1) is located within a few hundred feet of the installation boundary to the north and within 1500 feet of three closed water supply wells (Nos. I-74, I-75 and I-80). Since the ground water flow direction of the shallow surface aquifer is undetermined in this area, orthodichlorobenzene (ODCB) and other waste contaminants from Site S-1 may have seeped to the underlying alluvial stratum and migrated either towards the wells or the installation boundary. A potential problem exists with closed water supply wells in that the grouting and casing materials may have deteriorated allowing a potential pathway of contaminant migration to the underlying Edwards Aquifer. The actual condition of Well Nos. I-74, I-75 and I-80 is unknown.

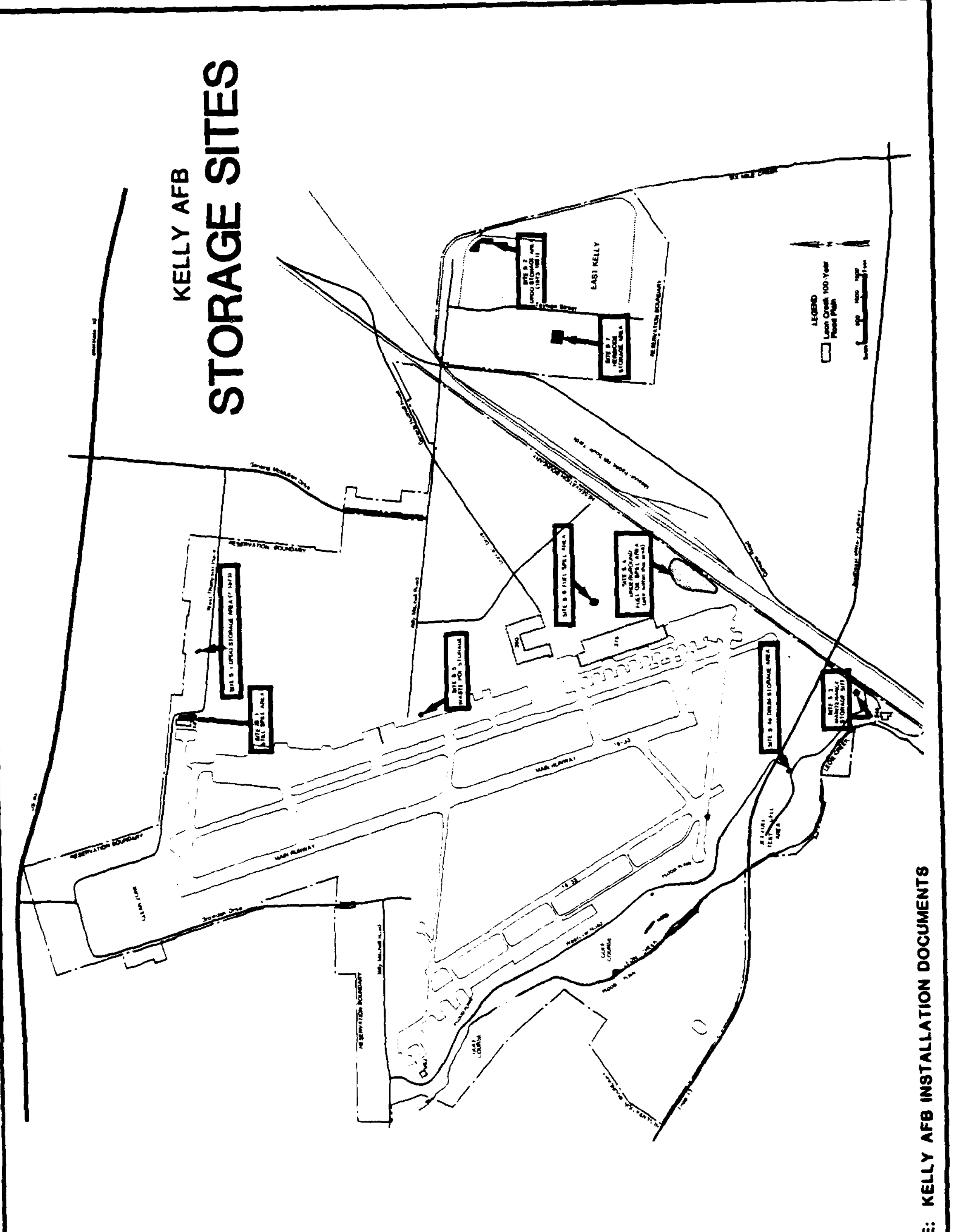
Site S-2 East Kelly DPDO Storage Area

The East Kelly DPDO Storage Area (site S-2) contains a number of storage areas for hazardous materials. This area is adequatedly contained and presents no potential for contaminant migration.

Yard 13 was used for oil storage in the past and for other liquid products received on base such as trichlorethylene and perchlorethylene. One dump truck load of oil contaminated soils was removed from Yard 13 in December of 1980 and deposited in the Chemical Evaporation Pit (Site E-3). No chemical analyses were performed on these soils.

Twenty-five to thirty mineral oil transformers were stored during the fall of 1980 at Yard N located west of Building 3000 and north of Building 3008. Minor leakage from these transformers was observed and the transformers were subsequently transferred to containers to minimize the leakage. No soils analyses have been performed in this area. The

FIGURE 4.3



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

location of the leakage and the suspected minor amount of leakage make this site a very low priority in terms of potential for contaminant migration. This site was also used extensively during the 1960's and 1970's for hazardous chemicals storage. Drum spillage occurred. Water well #11 is located approximately 100 feet from the southeast end of the old drum storage area.

In addition, about 30 drums of carbon cleaning compounds (ODCB) were stored at Yard N on concrete pads. These drums appeared in good condition and no contamination was observed.

Hazardous Waste Storage

Several other hazardous waste and material storage sites are located on Kelly AFB which are areas of concern and were reviewed during the on-site survey. These storage sites are also illustrated in Figure 4.3 along with the major fuel and chemical spill areas.

Site S-4a - Hazardous Waste Storage

A 100-foot by 100-foot hazardous waste storage site is located in the Building 620 storage yard. This site is surrounded by an 8-foot fence. 55-gallon drums of plating tank bottoms and sludges and caustic or sulfuric acid have been stored here during the past two years prior to contract disposal off site. Prior to this time, drums of waste ODCB, perchlorethylene, phenols, cyanide sludge, hexavalent-chromium sludges and other liquids were stored at this site. The site is paved with asphalt and is surrounded with a 2-foot clay dike. Minor drum leakage has occurred at this site during storage. However, the site is considered to present minor potential for contaminant migration.

Prior to 1970, these wastes were disposed at various landfill locations on Kelly AFB. Since 1972, these waste drums have been disposed off site by contract disposal.

Site S-3 - Maintenance Storage Site

As illustrated in Figure 4.3, this site is located along Berman Road in the 500 area. This site is utilized for storage of materials used in the shop maintenance areas at Kelly AFB. Materials such as ODCB and perchlorethylene are stored here in an asphalt paved area enclosed with a fence. The site is covered with a roof and partially enclosed with a 1 to 2 foot earth dike. Drum leakage occurs at this site due to ambient temperature changes and subsequent liquid volume changes. A po-

tential for contaminant percolation into the ground at this site exists. The site is less than 1000 feet from Leon Creek.

Site S-5 - Waste POL Storage Area

This site is located in the 1600 area and consists of eight 25,000-gallon old underground storage tanks used to store waste POL, used solvents, hydraulic fluid, kerosene and purging fluids (see Figure 4.3). Four of the tanks are used for waste POL and used solvents which are later reclaimed. These tanks are not monitored for leakage and whether the tanks leak is unknown. If leakage has occurred in the past, a pathway of contaminant migration exists through the alluvial stratum to Leon Creek. The distance to Leon Creek is about 6000 feet.

Site S-7 - Herbicide Storage Area

An approximate two acre area at East Kelly (Site S-7) was used for two years during the early 1970's to store an unknown number of 55 gallon drums of herbicide. The drums were stored on wood pallets on the ground. Based on personnel interviews the drums leaked due to expansion and contraction caused by ambient temperature changes. Due to the nature of the waste stored and the past spillage a potential of contamination migration exists.

Chemical Evaporation Pits

Three chemical evaporation pits have been used during various periods at Kelly AFB to accumulate liquid chemicals. A summary of site locations, period of operation, suspected types of waste disposed, method of operation, site geologic setting and site surface drainage is presented in Table 4.4. Figure 4.4 illustrates each pit's location.

Site E-1 Chemical Evaporation Pit

This site, located under the asphalt paved metal storage yard is located to the south of Building 545 and is within 100-150 feet of Leon Creek located to the west. The Berman Road surface water drainage ditch borders the east side of the site. The site was used originally as a disposal pit (2-4 feet depth, 250 x 150 feet) for chromium plating sludges and wastes from the chromium plating operations which existed in Building 545 from about 1940 to 1955. The pit was closed with gravel and fill material at the same time the chromium plating operation moved

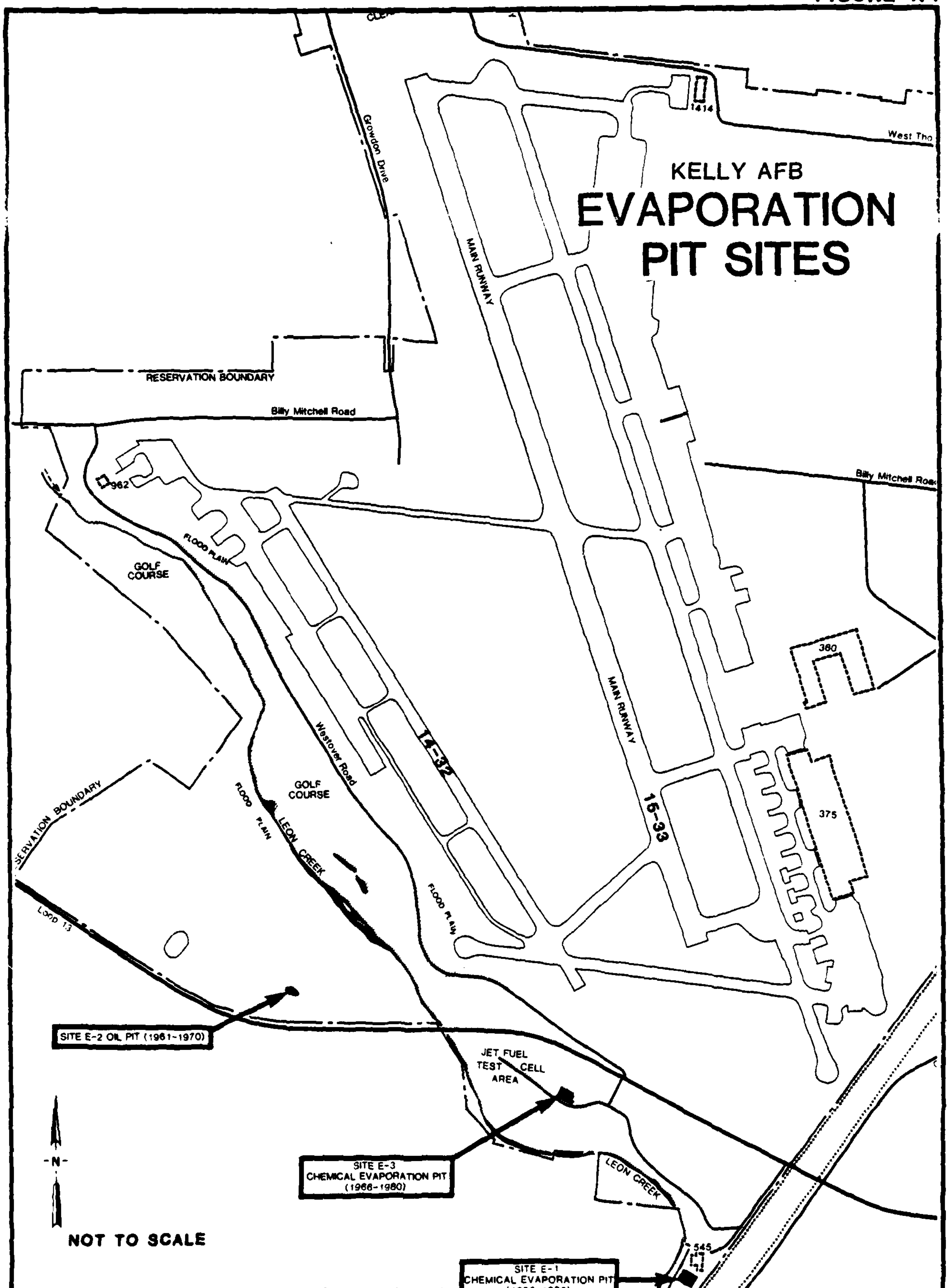
TABLE 4.4

SUMMARY OF KELLY AFB CHEMICAL EVAPORATION PIT DISPOSAL

Site No.	Site Name	Period of Operation	Approximate Area (Acres)	Suspected Types of Wastes	Estimated Quantity of Wastes (Acre - ft)	Method of Operation	Closure Status	Geological Setting	Surface Drainage	Comments
E-1	Chemical Evaporation Pit	1940-1966	<2	Chrome plating sludges, waste oil, ODCB, cresols, acid sludges, herbicides, pesticides.	2-4	Liquid waste disposal pit. 2'-3' operating liquid depth. 1st pit unlined and closed by filling with gravel and soil. 2nd pit over top 1st pit with thin clay liner.	Closed with local soil and gravel and paved over with asphalt.	Lewisville silty clay, silty clay loam, gravel, 0-5' depth, medium permeability.	To Leon Creek	2nd pit at same site had a thin clay liner which ruptured due to local excavation. Past leachate seepage has been observed to Leon Creek.
E-2	Oil and Chemical Evaporation Pit	1961-1970	<1	Waste oils and contaminated fuels.	<1	Liquid waste disposal pit for waste fuels. Top layer generally burned.	Waste materials cleaned out. A pond presently exists at this area on the Golf Course.	Gravelly clay over clay, 3-5' depth, low permeability.	To Leon Creek	Exists as a pond on the Golf Course.
E-3	Oil and Chemical Evaporation Pit	1966-1980	<0.5	Liquid wastes such as: Orthodichlorobenzene, cresols, tank cleaning sludges, waste contaminated fuels and oils, pesticides, and herbicides.	2-4	Liquid and sludge waste disposal impoundment. 2-3' operating liquid depth.	Not closed. Liquid present in existing pit.	Clay and sandy loam over gravel locally, 3-8' depth, medium permeability.	To Leon Creek	Contaminant migration areas evident on infrared aerial photography.

Source: Compilation of Kelly AFB Personnel Interviews and installation documents.

FIGURE 4.4



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

from Building 545. In the early 1960's, the site was apparently lined with a thin clay liner over the fill material and used again as a chemical disposal pit until 1966. Carbon cleaning compounds (ODCB), cresols, acid sludges and cyanide wastes were disposed at this site. The pit is located in an alluvial area adjacent to Leon Creek and leachate seeps have been observed to Leon Creek in the past. Even though this site is presently closed and paved with asphalt, the pathway exists for migration of contaminants into Leon Creek particularly during high water flow in Leon Creek.

Site E-2 Chemical Evaporation Pit

This site is located in the golf course area near Leon Creek within Landfill Site D-7 where a small pond currently exists. Waste oils and contaminated fuels were disposed at Site E-2 from 1961 to 1970. The oil layer was burned off frequently. This site, coupled with other landfill activities in this vicinity, presents a potential for migration of contaminants through alluvial stratums to Leon Creek which is situated less than 1000 feet down-gradient from the pit.

Site E-3 - Chemical Evaporation Pit

Site E-3 is located north of Building 620 between the old sewage plant digester and the C5A jet engine test cells. This pit was excavated originally to 2 to 3 feet depth and lined with packed clay. The pit was originally placed in operation to evaporate materials such as orthodichlorobenzene and to dispose of waste oils and liquids. The current pit depth is five feet since the dike has been raised several times around the site to prevent waste overflow. Wastes have not been disposed at this pit since 1980. However, the site remains unclosed and contains several feet of liquid which presents a hydraulic head.

Based on a Texas Water Quality Board letter, analysis of a sediment sample from site E-3 indicates PCB, heavy metal, insecticide and herbicide contamination. In addition, a review of infrared aerial photography at this site indicates lateral migration of leachate from the site. Since the site is only about 700 feet from Leon Creek, a good potential exists for migration of contaminants to Leon Creek through the alluvial stratum particularly since the site is unclosed and has a source of hydraulic head.

Landfill Areas

Seven past landfill areas exist on Kelly AFB which were used from 1917 to 1970 for disposal of general refuse and liquid and sludge hazardous wastes generated in the shop operations. Since 1970, all solid wastes have been disposed by contract operations off site. Very few records exist regarding these landfills and few individuals remain at Kelly AFB who recollect much about this site. Hence, the majority of information was collected through personnel interviews with retired employees and a review of historical aerial photography. A description and evaluation of each site is presented herein. A summary of landfill disposal site locations and other pertinent information is presented in Table 4.5. Figure 4.5 illustrates the landfill site locations.

Site D-1 Landfill

Site D-1 located under Building 962 was apparently used prior to World War II for disposal of hardfill and general refuse from Kelly AFB. Core drillings conducted during construction of Building 962 in the early 1960's indicate that trash was filled to a depth of 15-18 feet below 3-4 feet of top soil. No evidence of oily materials or sludge disposal was observed in these core samples based on personnel interviews and a review of the core boring logs. Since the site was developed and used before major maintenance activities began at Kelly, the wastes disposed at this site would generally present less potential for contamination than other landfill sites at Kelly AFB. This site is located within the Leon Creek floodplain.

Site D-2 Landfill

Based on a review of past aerial photography and discussions with one key personnel involved in disposal operations at Kelly AFB during the 1950's and 1960's, a landfill site existed in the golf course area along Leon Creek, as illustrated in Figure 4.5. The site was closed around 1957. Based upon aerial photography, the site apparently opened around 1942. The area fill method was used for disposal of primarily construction rubble, general refuse, scrap metal and garbage. The area on the northeast side of Leon Creek was used primarily for construction rubble disposal and presents no potential contaminant migration problems. However, due to the nature of the materials disposed and the

TABLE 4.5

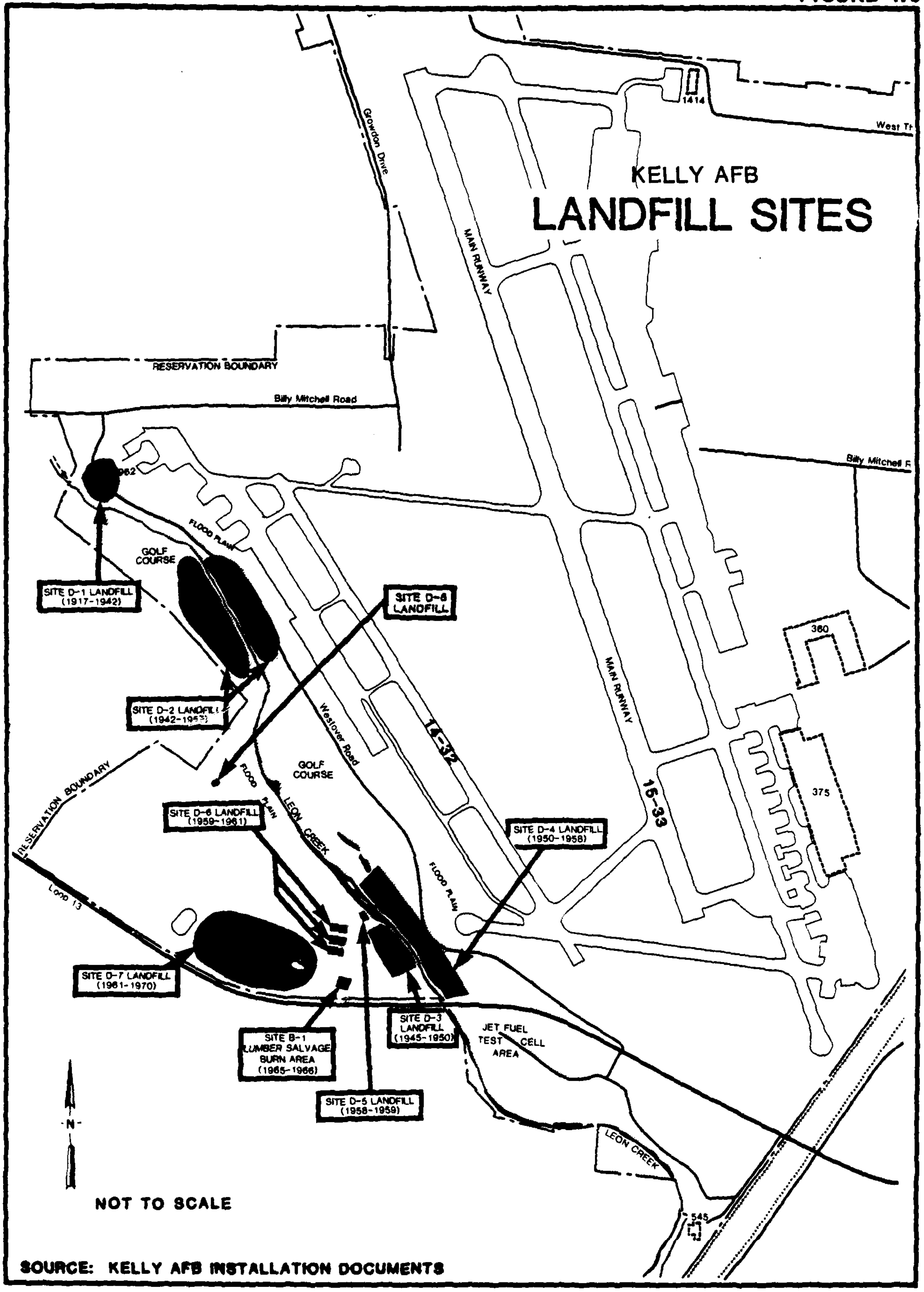
SUMMARY OF KELLY AFB LANDFILL DISPOSAL SITES

Site No.	Site Name	Period of Operation	Approximate Area (Acres)	Suspected Types of Wastes	Estimated Quantity of Wastes (Acre - ft)	Method of Operation	Closure Status	Geological Setting	Surface Drainage	Comments
D-1	Landfill (WWI)	1917-1942	5-6	Hardfill, garbage, WWI munitions, metal, general refuse.	75	Area fill method to depth 15-18 ft. with daily soil cover.	Closed with 2-4 ft. of top soil cover.	Clay loam, loam and gravel, 2'-6' depth, medium to high permeability.	To Leon Creek	Well covered and graded. Building 962 is situated on this site.
D-2	Landfill	1942-1957	28	Construction rubble, general refuse, scrap metal, garbage, hardfill, suspected mixed solvents and waste drums.	Unknown	Area fill method with daily soil cover.	Closed with several ft. of soil cover. Golf course located on parts of site.	Clay and sandy loam over gravel locally, 3-8' depth, medium permeability.	To Leon Creek	Well covered and graded. No evidence of hazardous waste visible.
D-3	Landfill	1945-1950	5-6	Hardfill, general refuse, drums of electroplating sludge, DDT, pesticides drums, mixed solvents, oils, (trichloroethylene, ODCB, Waste POL, Phenol, Perchloroethylene, etc.)	50	Trench and fill method to 8 ft. to 12 ft. depth. Daily cover of 6 in. to 2 ft.	Closed with local soil cover. Seeded with grass. Golf course located on site.	Clay loam, loam and gravel, 2'-6' depth, medium to high permeability.	To Leon Creek	Well covered and graded. Trenches visible on Infrared aerial photography.
D-4	Landfill	1950-1958	15	Hardfill, general refuse, drums of electroplating sludge, pesticides, drums of mixed solvents, oils (trichlorethy[illegible]e, ODCB, Waste [illegible], Phenol, Perchloroethylene).	120	Trench and fill method to 8 ft. to 12 ft. depth. Daily cover of 6 in. to 2 ft.	Closed with 2 ft. of local soil cover and seeded with grass. Golf course located on site.	Clay loam, loam and gravel, 2'-6' depth, medium to high permeability.	To Leon Creek	Well covered and graded. Trenches visible on Infrared aerial photography.

TABLE 4.5
(Continued)

Site No.	Site Name	Period of Operation	Approximate Area (Acres)	Suspected Types of Wastes	Estimated Quantity of Wastes (Acre - ft)	Method of Operation	Closure Status	Geological Setting	Surface Drainage	Comments
D-5	Landfill	1958-1959	0.1	Drums of mixed solvents, waste oils, (Trichloroethylene, ODCB, Phenol, Perchloroethylene) electroplating sludge, waste pesticides.	1	Trench and fill method to 8 ft. 12 ft. depth. Daily cover of 6 in. to 2 ft.	Closed with 2 ft. of local soil cover and seeded with grass. Some waste materials transferred to site D-6. Golf course located on site.	Clay loam, loam and gravel, 2'-6' depth, medium to high permeability.	To Leon Creek	Well covered and graded. No evidence of hazardous waste visible.
D-6	Landfill	1959 -1961	1.5	Drums of mixed solvents, waste oils, (Trichloroethylene, ODCB, Phenol, Perchloroethylene) electroplating sludge, waste pesticides.	12	Trench and fill method to 8 ft. to 12 ft depth. Daily cover of 6 in. to 2 ft.	Closed with 2 ft. of local soil cover and seeded with grass. Golf course located on site.	Clay and sandy loam over gravel locally, 3-8' depth, medium permeability.	To Leon Creek	Well covered and graded. No evidence of hazardous waste visible.
D-7	Landfill	1961-1970	35	Hardfill, general refuse, drums of electroplating sludge, DDT, pesticides drums, mixed solvents, oils, trichloroethylene, ODCB, Waste POL, Phenol, Perchloroethylene, etc.)	300	Trench and fill method to 8 ft. to 12 ft. depth. Daily cover of 6 in. to 2 ft.	Closed with 2 ft. of local soil cover and seeded with grass. Golf course located on site.	Gravelly clay over clay, 3'-5' depth, low to medium permeability.	To Leon Creek	Well covered and graded. Trenches visible on Infrared aerial photography.
B-1	Salvage Burn Area	1965-1966	<1	Salvage waste lumber burn area.	<1	Salvage area - open burn area.	Closed with 2 ft. of local soil cover and seeded with grass as part of Golf Course.	Clay and sandy loam over gravel locally, 3-8' depth, medium permeability.	To Leon Creek	

FIGURE 4.5



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

proximity of the landfill area on the southeast side of the creek to the creek a potential for contaminant migration exists.

Site Nos. D-3, D-4, D-5, D-6 and D-7 Landfills

From 1945 to 1970 a number of landfill sites were located in the vicinity of Leon Creek as illustrated in Figure 4.5. These sites were operated using the trench method of disposal. The trenches were excavated from 8-12 feet in depth into the alluvial areas along the creek. Waste materials disposed in these trenches include: general refuse, drums of electroplating sludges, drums of mixed solvents including waste perchlorethylene and trichloroethylene, orthodichlorobenzene, waste POL, phenolic wastes, cresols, waste pesticides including DDT. Many of these wastes either are non-biodegradable or slowly biodegradable and will persist in a landfill. Many of the solvents are also highly mobile in a ground-water environment.

Each of the sites is presently closed with several feet of local soil cover and seeded with grass as part of the Kelly AFB golf course. A review of infrared aerial photography, illustrated in Appendix F, indicates trenches in many of these areas. This information was confirmed through review of historical aerial photographs from 1945 to 1970 and through personnel interviews. Each of these areas presents a high potential for hazardous waste contamination through the alluvial stratum into Leon Creek. The potential for migration is increased with precipitation and high flow in Leon Creek. Sites D-6 and D-7 are more likely to be a source of contaminant migration from precipitation while sites closer to the creek (D-3, D-4 and D-5) are susceptible to high flows in Leon Creek. Golf course irrigaton in this area will mitigate the beneficial aspects of a net evaporation situation.

Site D-8 Landfill

A small site (D-8), illustrated in Figure 4.5, was utilized in the past for construction rubble and hardfill disposal. This site does not present a potential for contaminant migration due to the nature of the wastes disposed of.

Site B-1 Salvage Burn Area

Site B-1, illustrated in Figure 4.5, was used as a lumber salvage yard during 1965-1966. Scrap lumber was burned periodically. No potential for contamination exists at this location.

Radioactive Waste Disposal Sites

Figure 4.6 illustrates two low-level radioactive waste disposal sites at Kelly AFB. Site RD-1 was used prior to 1958 for disposal of low level radioactive wastes such as: electron tubes, oxygen equipment dials marked with luminescent paint, calibration sources from radioactive measuring instruments, and spark gaps and parts from voltage regulators which contained small amounts of radioisotopes. The wastes were well-contained within sealed reinforced concrete pipes and disposed several feet below the ground surface. No radioactive leakage has been detected at this site and, due to the nature of the containment method, none is expected. This site is not a site of concern with respect to this study.

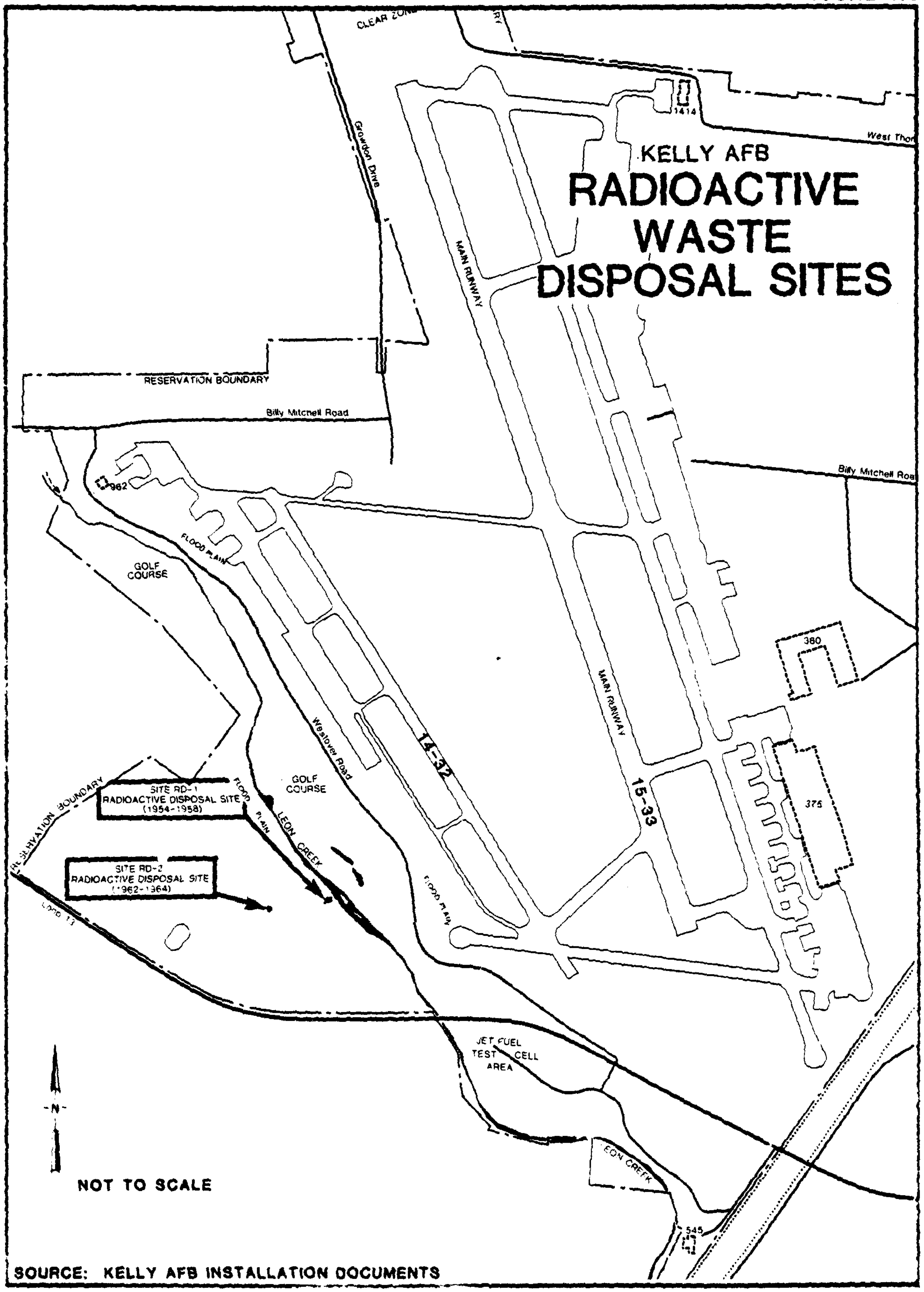
Site RD-2 was used for a one-time dump of radioactive animal tissue from Brooks AFB in about 1964. This materials was buried in drums in a deep ravine on the golf course and covered with 3-4 feet of earth. At present, the site is probably covered by 10-12 feet of earth due to earth movement during the golf course construction. The material contained very low levels of radiation and very short half-lifes. This site is not an area of concern with respect to a potential for contaminant migration.

Wastewater Treatment System

The industrial wastewater treatment facility (IWTF) at Kelly AFB has undergone many modifications between the initial operation in the 1930's and the present day operation. Prior to 1959 the facility was operated as a trickling filter process and treated primarily sanitary sewage. Industrial wastes generated at Kelly AFB were discharged to either the storm sewers or the City of San Antonio sewers. A small amount of process wastewaters was discharged to the wastewater treatment facility.

In 1959, the system was modified such that sanitary wastewaters were discharged to the City of San Antonio sewers. A diversion structure was installed in the Berman Road storm sewer in order to divert process wastewaters that had been discharged to Leon Creek to the Kelly IWTF. The structure diverted wastewaters to the IWTF except during periods of high flows when some of the water overflowed a weir and was channeled to Leon Creek. The high flow periods were caused by excessive stormwater inflow. Also, at this time, the IWTF was upgraded by adding

FIGURE 4.6



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

physical/chemical treatment prior to biological treatment. The physical/chemical treatment process consisted of coagulation, flocculation and clarification by alum and lime addition.

In the early 1970's, a sewer was installed in the 300 Building area. The purpose of this industrial sewer was to carry the process wastewaters which had been discharged to a storm sewer. This helped eliminate the direct discharge of heavy metal wastes from the Berman Road storm sewer to Leon Creek that would occur during periods of heavy rainfall. In 1978, a chromium reduction process was brought on line at the IWTF.

The major sources of hazardous wastes that have discharged to the Kelly IWTF are from the shops. Since the 1960's, the procedure at Kelly AFB has been to discharge dilute wastes to the plant via the storm and process sewers and to transport the concentrated wastes to the sewer via tank trucks or dumpsters. The concentrated wastes include waste acids which contain heavy metals and cyanide wastes. The heavy metals in the wastes include chromium, lead, nickel, cadmium, copper, mercury, silver and zinc. A review of the operating reports from 1975 to 1981 indicated low IWTF influent concentrations of lead, mercury, zinc, nickel, silver and copper. Generally, the influent values were nearly the same as the NPDES permit effluent limitations. The heavy metals in the highest concentration are chromium and cadmium. As an example from a 1970 OEHL report, total chromium concentration in the influent wastewater sample was 11 lbs/day. The effluent permit limitation is a daily average value of 9.63 lbs/day.

In addition to the heavy metal wastes discharged from the shops, other wastes have been discharged to the IWTF either directly into the sewer or indirectly via the Chemical Evaporation Pit (Site E-3). Wastes sent to the Evaporation Pit included phenolic carbon removal compounds, emulsifiers, waste POL and solvents.

The IWTF at Kelly AFB consists of pretreatment of cyanide, chromium, and concentrated acid wastes followed by physical/chemical and biological treatment of all the wastewaters. Pretreatment facilities are provided for the reduction of hexavalent to trivalent chromium, and the oxidation by chlorine of cyanide. As discussed previously, the

physical/chemical treatment facility consists of flocculation and clarification aided by lime and alum. Following physical/chemical treatment, the wastewater flows to the biological treatment facility which consists of a trickling filter and a final clarifier. The treated effluent is discharged to Leon Creek.

A review of the operating reports for the period of operation from 1975 to 1981 indicated good treatment performance. The IWTF was in compliance with its discharge permit a high percentage of the time. The most serious permit violations were associated with effluent cadmium. For example, the NPDES permit average value is 0.13 lbs/day and the average for September 1981 was 0.30 lbs/day.

There have not been any major spills (greater than 100 gallons) reported at the Kelly IWTF. Minor spills, such as leaks in piping, pumps and concrete tanks, which have occurred in the past have been concentrated in the pretreatment area. Other minor spills such as those from the truck unloading operations have also occurred in this area. This area drains down an asphalt drive to a grassy area near Leon Creek. The vegetation, mostly grass, in the area appears to be healthy. This site is not a potential problem with respect to this study.

Sludge Landspreading Areas

Several sludge storage, spreading and drying areas have been used in the past at Kelly AFB. Table 4.6 summarizes past site locations, types of sludges disposed, method of operation, and the site geologic setting. Figure 4.7 illustrates the site location.

Sludge Drying Beds

Before 1959, the mostly domestic waste-generated sludges produced at the Kelly IWTF were pumped to a digester. After digestion the sludge was pumped to the old drying beds (SD-2). This area is covered with topsoil and seeded with grass and does not present a potential for contamination due to the nature of the sludge at that time. Since the 1960's sludge has been dewatered on sludge drying beds at Site SD-1. Filtrate from these beds is contained and treated. Site SD-1 does not present a potential for contaminant migration. The dewatered cake from the old drying beds was applied to soil at Site SA-1 on the Kelly AFB golf course.

TABLE 4.6

SUMMARY OF KELLY AFB SLUDGE STORAGE, SPREADING AND DRYING AREAS

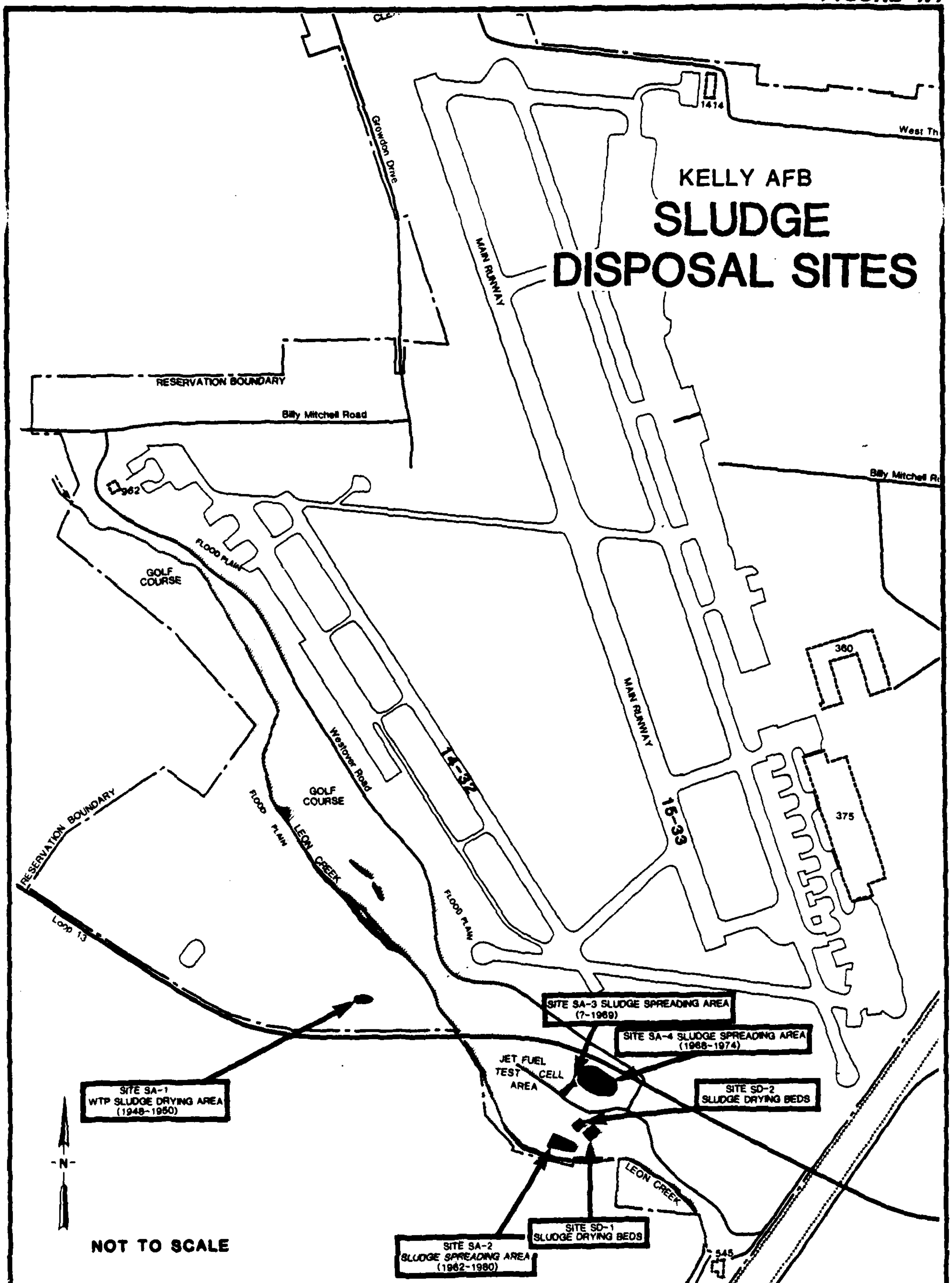
Site No.	Site Name	Period of Operation	Approximate Area (Acres)	Suspected Types of Wastes	Estimated Quantity of Wastes (Acre - ft)	Method of Operation	Closure Status	Geological Setting	Surface Drainage	Comments
SA-1	Golf Course WTP Sludge Drying Area	1948-1950	<1	IWTF sludges containing minor quantities of heavy metals. Primarily a domestic waste activated sludge.	<2	Landspread area for air drying of waste treatment plant sludges. Thickness of layer unknown.	Closed with top soil cover and seeded with grass. Golf Course exists in this area.	Gravelly clay over clay, 3-5' deep, low permeability.	To Leon Creek	This side is located amongst many landfill sites.
SA-2	Sludge Drying Lagoon	1962-1980	1.5	IWTF sludges containing Cr, Cu, Fe, Mn, Ni, Zn, Pb, Cd, Cn.	3-5	Unlined surface impoundment used for drying and containment of waste treatment plant sludges when sludge drying beds are inoperative.	Not closed. Willow trees growing in existing lagoon.	Clay and sandy loam over gravel locally, 3-8' depth, medium to high permeability.	To Leon Creek	Seven monitoring wells exist around the perimeter of this site.
SA-3	Sludge Spreading Area	? - 1969	3	IWTF sludges containing Cr, Cu, Fe, Mn, Ni, Zn, Pb, Cd, Cn.	<3	Sludges from site SA-2 were landspread over this area for air-drying three times since 1969.	Area seeded with grass.	Silty clay, silty clay loam, and grave, 0-5' depth, medium permeability.	To Leon Creek	Core borings of existing site material indicates significant heavy metal content.

TABLE 4.6
(Continued)

SUMMARY OF KELLY AFB SLUDGE STORAGE, SPREADING AND DRYING AREAS

Site No.	Site Name	Period of Operation	Approximate Area (Acres)	Suspected Types of Wastes	Estimated Quantity of Wastes (Acre - ft)	Method of Operation	Closure Status	Geological Setting	Surface Drainage	Comments
SA-4	Sludge Spreading Area	1968-1974	0.5	IWTP sludges containing Cr, Cu, Fe, Mn, Ni, Zn, Pb, Cd, Cn.	<0.5	Landspread area for WTP sludges in the past.	Area seeded with grass.	Silty clay, silty clay loam, and gravel, 0-5' depth, medium permeability.	To Leon Creek	
SD-1	Existing Sludge Drying Beds	1960's - 1980's	—	IWTP sludges containing Cr, Cu, Fe, Mn, Ni, Zn, Pb, Cd, Cn.	<0.1	Dewatering operation for existing waste treatment plant sludges. Filtrate is contained and treated.	In operation.	Sludge beds contained with concrete and underdrains.	To Leon Creek	
SD-2	Old Sludge Drying Beds	<1960's	—	IWTP sludges containing Cr, Cu, Fe, Mn, Ni, Zn, Pb, Cd, Cn.	<0.1	Old dewatering operation for past waste treatment plant sludges.	Area covered with topsoil and seeded with grass.	Clay and sandy loam over gravel locally, 3-8' depth, medium to high permeability.	To Leon Creek	

Source: Compilation of Kelly AFB Personnel Interviews and installation documents.



SOURCE: KELLY AFB INSTALLATION DOCUMENTS

Sludge Lagoons and Landspreading Areas

From 1959 to June 1981 the sludge was pumped to the Industrial Waste Sludge Lagoon (Site SA-2) at a rate of approximately 1900 gallons per day. There was not a supernatant discharge for the waste sludge lagoon. Site SA-2 is unlined and approximately 350 feet by 200 feet and within 100 feet of Leon Creek. Seven monitoring wells have been installed around the Industrial Waste Lagoon as discussed in Section 3. Water quality monitoring data for these wells indicates the presence of low levels of nickel (0.3 mg/l) in data recorded October 31, 1980 for monitoring well number 2. It is not known at this time if, in fact, well number 2 is a down-gradient well detecting the migration of contamination or that the sludge lagoon is the source of the contamination. Additional water quality analyses, also dated 31 October 1980, conducted on water samples from other sludge lagoon monitoring wells for cadmium, mercury, copper, chromium, zinc, silver and lead failed to detect contamination above detection limits. Water quality analyses dated May 6, 1981 and September 24, 1981, conducted on additional water samples from the sludge lagoon monitoring wells detected contamination as illustrated in Table 4.7. Analyses for other metals not listed in Table 4.7 were below detectable limits.

Sludge from the Industrial Waste Sludge Lagoon was transported by dump truck to the field (Site SA-4) between the Chemical Evaporation Pit (Site E-3) and Military Highway once or twice per year from 1968 to 1974. The sludges were landspread and are currently seeded with grass. Sixteen core samples at 4-inch depth were collected in October, 1980 within this sludge landspreading area. Analysis of the samples indicate some contain significant concentrations of heavy metals as illustrated in Table 4.8. However, recent RCRA Extraction Procedure (EP) Toxicity data (August, 1981) indicates that the metals do not leach out in this EP test. This finding minimizes the potential for contaminant migration from this site. Based on the geologic setting and nature of the waste sludges, this site represents a minor potential for leachate migration into Leon Creek.

Prior to 1969, sludges were also landspread at Site SA-3 near the Jet Test Cell Area. Since the sludges are considered similar to those at Sites SA-2 and SA-4 and that Site SA-3 is even closer to Leon Creek a

TABLE 4.7

INDUSTRIAL WASTE STUDY LAGOON MONITORING WELL CONTAMINATION

Well No.	Date of Sample	Contaminant	Contaminant Concentration
1	May 6, 1981	Cadmium	0.038 mg/l
		Nickel	0.2 mg/l
	Sept. 24, 1981	Chromium	0.25 mg/l
		Chromium	53 μg/l
		Nickel	211 μg/l
2	May 6, 1981	Cadmium	0.04 mg/l
		Total chromium	0.25 mg/l
		Zinc	0.22 mg/l
	Sept. 24, 1981	Nickel	95 μg/l
3	May 6, 1981	Cadmium	0.02 mg/l
		Total chromium	0.1 mg/l
	Sept. 24, 1981	Cyanide	0.01 mg/l
		Nickel	95 μg/l
4	May 6, 1981	Cadmium	0.01 mg/l
		Total chromium	0.1 mg/l
	Sept. 24, 1981	Cyanide	0.01 mg/l
		Nickel	83 μg/l
		Arsenic	21 μg/l
5	May 6, 1981	Cadmium	0.02 mg/l
		Total chromium	0.15 mg/l
		Arsenic	41 μg/l
		Cyanide	0.02 mg/l
		Nickel	163 μg/l
6	May 6, 1981	Cadmium	0.007 mg/l
		Total chromium	0.1 mg/l
		Cyanide	0.02 mg/l
		Nickel	127 μg/l
		Arsenic	59 μg/l
7	May 6, 1981	Cadmium	0.005 mg/l
		Total chromium	0.15 mg/l
		Arsenic	20 μg/l

SOURCE: USAF OEHL

TABLE 4.8

IWTF SLUDGE LANDSPREAD AREA ANALYSES
Site SA-4

Metals of Concern	Concentration Range mg/gram Dry Weight
Chromium (Cr)	0.09-11.5
Copper (Cu)	0.21-10.8
Iron (Fe)	0.16-3750
Manganese (Mn)	38-4720
Nickel (Ni)	1.3-178
Zinc (Zn)	0.08-25.2
Lead (Pb)	0.08-34.9
Cadmium (Cd)	0.66-40.3
Mercury (Hg)	0.002-0.052
Cyanide (Cn)	<0.2-24.8

Note: (1) Samples collected during October, 1980.
(2) Core Sample depths (4 inches)
(3) Source USAF OEHL documents

similar potential for contaminant migration exists. Presently, sludges generated at the plant are being discharged to the sand drying beds.

Septic Tanks

There are eight septic tanks on Kelly AFB which are located at various areas around the base including the golf course area. Based on the on-site survey, these units have been used primarily for disposal of sanitary sewage and should not pose a hazard from the standpoint of possible ground water contamination.

Oil/Water Separators

There are fourteen oil/water separators located on Kelly AFB including separators near Building Nos. 1516, 375, 358, 340, 347, 650, 645 and 655. The recovered oil is sold to an outside contractor and the wastewaters are sent to the waste treatment plant. Based on the on-site survey waste spillage has not occurred near the shop site and the units should not pose a hazard from the standpoint of possible ground-water contamination.

Liquid Waste Incinerator

A liquid waste incinerator was installed at the waste treatment plant in 1974 and became operational in 1977. This incinerator was installed for incineration of cyanide wastes using waste oils and JP-4. Use of the incinerator has been limited. Four 5,000-gallon storage tanks associated with the incinerator are diked with concrete which sufficiently contain any spills. No past contamination has occurred at this facility.

EVALUATION OF PAST DISPOSAL FACILITIES

Twenty-six disposal sites associated with Kelly AFB were identified as containing hazardous material resulting from past waste disposal activities. These sites have been assessed using a rating system which takes into account factors such as site characteristics, waste characteristics, potential for contamination and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are summarized in Table 4.9. Rating scores were developed for the individual sites and the sites are listed in order of ranking. The rating system is designed to indicate the relative need for more detailed site assessment and/or remedial action. The information presented in Table 4.9 should be used as a guide for assigning

TABLE 4.9
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
KELLY AFB

Rank	Site Number	Site Name	Period of Operation	Receptor Subscore	Pathways Subscore	Waste Characteristics Subscore	Waste Mgmt. Subscore	Overall Score	Refer To Appendix H Page No.
1	CS-1	Combined Site	1945-1970	80	67	100	82	81	H-2
2	D-4	Landfill	1954-1958	80	67	90	77	78	H-4
3	D-7	Landfill	1961-1970	61	65	100	82	77	H-6
4	D-3	Landfill	1945-1950	80	65	90	75	77	H-8
5	D-5	Landfill	1958-1959	76	64	70	75	71	H-10
6	D-6	Landfill	1959-1961	72	65	70	75	70	H-12
7	SA-2	Sludge Spreading Area	1962-1980	59	57	80	63	64	H-14
8	D-2	Landfill	1942-1957	80	37	70	63	61	H-16
9	S-1	DPDO Storage Area	?-1973	63	32	80	67	58	H-18
10	E-1	Chemical Evaporation Pit	1940-1966	41	59	80	50	58	H-20
11	S-4	Fuel Spill Area	1980	63	32	80	65	58	H-22
12	E-3	Oil Pits	1966-1980	37	52	80	59	57	H-24
13	E-2	Chemical Evaporation Pit	1961-1970	61	32	60	55	56	H-26
14	SA-4	Sludge Spreading Area	1968-1974	54	39	50	52	3	H-28
15	SA-1	Sludge Spreading Area	1948-1950	72	36	50	52	52	H-30
16	IS-1	Still Spill Area	1955-1972	63	38	50	59	52	H-32
17	S-6	Fuel Spill Area	Mid-1960's	59	32	60	55	50	H-34
18	SA-3	Sludge Spreading Area	?-1969	59	37	50	52	49	H-36
19	S-2	DPDO Storage Yard	1973-1981	72	27	60	48	48	H-38
20	S-7	Herbicide Storage Area	Early 1970's	72	22	60	36	46	H-40
21	SD-2	Sludge Drying Bed	1940's-1950's	59	39	50	39	46	H-42
22	RD-2	Radioactive Disposal Area	1962-1964	76	21	50	43	45	H-44
23	D-1	Landfill	1917-1942	52	22	50	59	44	H-46
24	FC-1	Fire Control Training Area	?-1950's	30	22	50	26	42	H-48
25	FC-2	Fire Control Training Area	1950's-1981	59	25	50	36	41	H-50
26	RD-1	Radioactive Disposal Area	?-1958	76	24	50	18	40	H-52
27	S-3	Maintenance Storage	?-1981	41	21	80	13	38	H-54

priorities for assessing Kelly AFB disposal sites. The rating for the individual disposal sites are presented in Appendix H for review.

In addition to the rating information in Table 4.9, the period of operation is also presented. It should be pointed out that the rating system does not take in consideration a "time factor." this is especially pertinent when considering spills, chemical disposal pits and the fire training areas.

Those sites ranked 1-15 are sites of primary concern based on their potential for waste migration off site. These sites require further investigation. They should be evaluated in order of ranking. The remaining sites are sites with the potential for contamination, but with a low probability for migration off site.

Due to the proximity of site nos. D-3, D-5, D-6 and D-7 to each other on the Kelly AFB golf course and near Leon Creek and the similarity of wastes disposed of any recommended monitoring program would logically consider these sites as a combined site. Therefore, this combined site (CS-1) was rated along with the individual sites. This combined site received the highest score of 81. The individual sites at CS-1 were operated during the period 1945 to 1970 with only one site open at the same time. Similar types of hazardous wastes were disposed via the trench method of landfill operation at each site. Typical wastes disposed include: metal plating sludges, orthodichlorobenzene, tetrachloroethylene, perchloroethylene, waste pesticides, phenols, cresols and waste oils in addition to general base refuse.

Site D-4 also received a high score of 78. This site is located on the opposite side of Leon Creek in the same vicinity as Site CS-1. The wastes disposed of and methods of operation were similar.

SECTION 5

CONCLUSIONS

SECTION 5

CONCLUSIONS

The goal of Phase I of the IRP was to identify the potential for environmental contamination from past waste disposal practices at Kelly AFB and to assess the probability of contaminant migration beyond the installation boundaries. Based on the results of the project te s one-week field inspection, review of office files and records, a interviews with base personnel, past employees and State and loc government employees, the conclusions given below have been deve The conclusions are listed by category for the sites identified on Kelly AFB. Table 5.1 contains the priority ranking of potential contamination sources at Kelly AFB.

1) Landfills

   a. Several individual disposal sites (Site Nos. D-3, D-5, D-6, D-7, SA-1, and E-2) will be considered as one combined site in terms of monitoring program development due to the sites proximity to each other on the Kelly AFB golf course and near Leon Creek and the similarity of hazardous wastes disposed at each site. This combined site (CS-1) has a high potential for migration of contaminants to Leon Creek and/or off the installation boundary. The combined site has received a score of 81. Specific conclusions for the individual landfill sites which comprise CS-1 are given below:

      1. The Site D-7 landfill (35 acres) operated during 1961-1970 and Site D-3 landfill (5-6 acres) operated during 1945-1950 also have high potential for off-site migration of contaminants. Trench disposal of hazardous waste and sludges in close proximity to Leon Creek (Site D-3) and the installation boundary (Site D-7) has created this situation. These sites have received scores of 77.

TABLE 5.1
PRIORITY RANKING OF POTENTIAL
CONTAMINATION SOURCES

Rank	Site Name	Period of Operation	Score
1	CS-1 Combined Site (D-3, D-5, D-7, SA-1, E-2)	1945-1970	81
2	D-4 Landfill	1950-1958	78
3	D-7 Landfill	1961-1970	77
4	D-3 Landfill	1945-1950	77
5	D-5 Landfill	1958-1959	71
6	D-6 Landfill	1959-1961	70
7	SA-2 Sludge Spreading Area	1962-1980	64
8	D-2 Landfill	1942-1957	61
9	S-1 DPDO Storage Area	?-1943	58
10	E-1 Chemical Evaporation Pit	1940-1966	58
11	S-4 Fuel Spill Area	1980	58
12	E-3 Chemical Evaporation Pit	1966-1980	57
13	E-2 Oil Evaporation Pit	1961-1970	56
14	SA-4 Sludge Spreading Ara	1968-1974	55
15	SA-1 Sludge Spreading Area	1948-1950	52
16	IS-1 Still Spill Area	1955-1972	52
17	S-6 Fuel Spill Area	Mid-1960's	50
18	SA-3 Sludge Spreading Area	?-1969	49
19	S-2 DPDO Storage Yard	1973-1981	48
20	S-7 Herbicide Storage Area	1970's	46
21	SD-2 Sludge Drying Bed	-	46
22	RD-2 Radioactive Disposal Area	1964	45
23	D-1 Landfill	1917-1942	44
24	FC-1 Fire Control Training Area	?-1950's	42
25	FC-2 Fire Control Training Area	1950's-1981	41
26	RD-1 Radioactive Disposal Area	?-1958	40
27	S-3 Maintenance Storage Area	?-1981	38

Note: This ranking was performed according to the Hazardous Evaluation Methodology described in Appendix G. Individual Site Rating Forms are in Appendix H.

2. Sites D-5 and D-6 operated during 1958-1961 received scores of 71 and 70 respectively. All types of sludge and liquid hazardous wastes generated at Kelly including orthodichlorobenzene, cresols, metal plating sludges, mixed solvents, and waste pesticides were disposed in trenches at these two areas. Excavation of the trenches in the alluvial stratum, the proximity of the sites to Leon Creek and the nature of the wastes disposed present a high potential for contaminant migration.

b. The Site D-4 landfill operated during 1950-1958 has a high potential for off-site migration of contaminants. Trench disposal of hazardous wastes on this 15-acre site and within the alluvial stratum immediately adjacent to Leon Creek has created a potential for contaminant migration. The site has received a score of 78.

c. The Site D-2 landfill (28 acres) operated during 1942 to 1957 received a score of 61 due to its proximity to Leon Creek and the nature of wastes disposed in the portion of this landfill located on the southwest side of Leon Creek. Site D-2 has a potential for contaminant migration to Leon Creek. The landfill portion on the east side of Leon Creek contains construction rubble and presents no potential for contamination.

d. The Site D-1 landfill operated from 1917-1942 was used as a World War I bombing target area and was probably used primarily for disposal of hardfill type materials. Core borings at the Building 962 site did not indicate any oily material disposal. This site received a score of 44 and poses little potential for contamination.

2) <u>Chemical Disposal Pits</u>

a. Chemical Evaporation Pit, Site E-1, was operated from 1950-1966. This site was used for disposal of chromium sludge, contaminated fuels and oils, and hazardous solvents including

orthodichlorobenzene and cresols. The site is currently covered by a parking lot. Past spillage and leakage to Leon Creek was observed during the site's active operation. Due to the site's proximity to Leon Creek and the installation boundary and the high mobility of the wastes disposed, a high potential for contaminant migration exists. This site received a score of 58.

b. The Site E-3, Chemical Evaporation Pit, was operated from 1966-1980. The pit was placed into operation for the purpose of evaporating solvent materials such as orthodichlorobenzene. Sludges, waste insecticides, spent solvents and waste materials containing PCB and heavy metals have been disposed at this site. Due to the nature of the wastes disposed, as well as the apparent leachate migration observed from infrared aerial photography, this site presents a high potential for pollutant migration. This site received a rating score of 57.

c. The Oil Evaporation Pit, Site E-2, was used from 1961-1970 to dispose and burn contaminated fuels and oils. This pit received a lower score (56) than the other pits since most of the wastes disposed at this site were burned.

3) Sludge Spreading Areas

a. Since the early 1960's, during periods when the sludge drying beds were inoperative, industrial waste treatment plant sludges containing heavy metals have been diverted to Site SA-2, the Industrial Waste Sludge Lagoon. The site's proximity to Leon Creek and the nature of the wastes disposed gave this site a score of 64.

b. Waste treatment plant sludges have also been land spread at Sites SA-4, SA-1, and SA-3 at various times in the past. These sites received scores of 55, 52 and 49, respectively. These sites are considered a medium potential for contaminant migration.

c. An old sludge drying bed area (Site SD-2), adjacent to the existing sludge drying beds, was used in the past for waste treatment plant sludges. Filtrate from the sludge could potentially contaminate the surficial aquifer. The site presents a low potential for contamination. The site received a score of 46.

4) <u>Storage/Spill Areas</u>

a. Site S-1, the old DPDO Storage Area was used as an intermediate storage area for mixed solvents, carbon cleaning compounds (with orthodichlorobenzene) and waste POL. Tank spillage from loading and unloading often flowed to a low lying pit area. This site was used from the early 1960's through 1973 when DPDO moved to East Kelly. This site represents a high potential for contamination due to the wastes spilled, proximity to the installation boundary and proximity to water supply well Nos. I-74, I-75 and I-80. Non-pumping wells are old and the well construction in terms of grouting and corrosion resistance of casing materials is questionable. Hence, these abandoned wells present a path of potential migration of contamination to the Edwards Aquifer. This site received a score of 58.

b. At Site S-4, the underground fuel system near building 367, approximately 9000 gallons of fuel was lost in 1980 due to a suspected leak in the underground pipe system. This leak has not yet been precisely located. The pipeline is not currently in operation. It is quite likely that the fuel is still located in the surficial aquifer and presents a potential for migration of contaminants through the alluvial stratum. The site received a score of 58.

c. Spillage of solvents from the Building 1414 solvent recovery still into a nearby ditch (Site IS-1) has occurred in the past. Due to the minor quantities spilled and location of this site, it presents a low potential for contamination. This site received a score of 52.

d. At Site S-3, old Fuel Storage Tank 930, a major spill of approximately 200,000 gallons of AVGAS occurred within the diked area in the mid-1960's. Most of the spill was recovered although an unknown quantity of fuel percolated into the ground in this vicinity because the diked area was unlined. This site presents a low potential for contaminant migration. This site received a score of 50.

e. Another major fuel spill (about 5000 gallons) occurred near the Building 652 pipe rack area (Site SA-3). Most of the fuel was contained although a small amount spilled into Leon Creek. This site received a score of 49 and has a low potential for contaminant migration.

f. Minor spillage of oils and solvents such as trichlorethylene and perchlorethylene occurred at Site S-2, Yard 13 of the DPDO Storage Yard. This site received a score of 48.

5) <u>Radioactive Disposal Sites</u>

a. Site RD-1, the Radioactive Disposal Area, was used prior to 1958 for disposal of low level radioactive wastes such as: electron tubes, oxygen equipment dials marked with luminescent paint, calibration sources from radioactive measuring instruments, spark gaps and parts from voltage regulators which contained small amounts of radioisotopes. Since the wastes are well-contained within a reinforced concrete pipe, the site is well marked, and no radioactive leakage has been detected, based on periodic bioenvironmental engineering surveillance, the site received a low score of 38 and is not considered a potential problem.

b. Radioactive animal tissues were buried at Site RD-2 around 1964. These tissues were transported from Brooks AFB and were buried in a deep ravine in the golf course area and covered with 3-4 feet of earth. This site is unmarked and presently

covered with 10-12 additional feet of soil due to golf course construction activities. The tissues which were buried had very short half-lifes. This site received a low score of 45.

6) Fire Control Training Areas

a. The Fire Control Training Areas FC-1 and FC-2 received scores of 42 and 41 respectively and are not considered areas of high potential for ground-water contamination.

SECTION 6

RECOMMENDATIONS

SECTION 6

RECOMMENDATIONS

In order to aid in the comparison of Kelly AFB's twenty-six sites with those sites identified in the IRP of other Air Force bases, a priority ranking scale has been developed. Those sites at Kelly AFB with overall scores greater than 55 are of primary concern based on their potential for waste migration off-site. They require further investigation in Phase II. Sites of secondary concern are those with scores of 0 to 54 and further investigations for these sites is not recommended unless data collected from other locations indicate a potential problem could exist at one of these sites. The following recommendations are made to further assess or prevent potential contaminant migration from waste disposal areas at Kelly Air Force Base. The recommended monitoring program for Phase II is summarized in Table 6.1.

RECOMMENDATIONS

1) The combined disposal site (CS-1) is considered to have a high potential for migration of contaminants and monitoring of the site is recommended. It is recommended that a ground-water monitoring program be established at this combined location to determine whether there is contamination and whether it has moved directly off base or via Leon Creek. Such a monitoring system should consist of at least one monitoring well located hydraulically up-gradient of Site D-7, and several monitoring wells installed near the installation boundary from the Leon Creek underpass at Military Highway northwest to the Security Hill area at distances not greater than 250 feet center to center. A monitoring well is also suggested between Leon Creek and down-gradient of Site E-2 to determine potential contaminant migration and ground-water flow direction.

TABLE 6.1

RECOMMENDED MONITORING PROGRAM FOR PHASE II - KELLY AFB

Site	Rating Score	Recommended Monitoring	Comments
CS-1	81	Install monitoring system consisting of one monitoring well hydraulically upgradient and wells installed near the installation boundary from the Leon Creek Underpass at Military Highway northwest to Security Hill at distances not greater than 250 feet center to center. A well is also recommended between Leon Creek and Site E-2. Wells should have a total depth of 35 feet and should be analyzed for the parameters in List A of Table 6.2.	Total wells requred: 21
D-4	78	Install a monitoring well system consisting of one upgradient well and three downgradient wells. The wells should have a total depth of 35 feet and be analyzed at a minimum for the parameters in List A of Table 6.2.	
D-2	61	Install a monitoring well system and analytical program similar to the Site D-4 program.	
E-1 E-3	58 57	Install a monitoring system consisting of four wells around the perimeter of each site. A common upgradient well should be established for both sites. The sampling and analysis program should, at a minimum, consist of the analyses in List A of Table 6.2.	
S-1	58	Install a monitoring well system consisting of four wells located around the site at approximate depths of 25 feet. Analyze these samples for the parameters in List A of Table 6.2.	These wells should be screened through the entire saturated section.
SA-2	64	Obtain well construction data, water levels and site specific geology from the driller for the seven existing wells at Site SA-2.	
Leon Creek Sediment	--	Perform a sediment sampling and analysis study along Leon Creek. Obtain samples at 15 locations specified in Section 6 and analyze for the parameters presented in List B of Table 6.2.	Sampling locations are required near Site Nos. D-1, D-2, D-4, D-5, SA-2, and E-1.
S-4	58	Map subsurface zones degraded by POL contamination using geophysical methods such as ground penetrating radar or electrical resistivity.	

At this time, it is believed that wells comprising such a monitoring system will have a total depth on the order of thirty feet based upon existing base monitoring wells. It must be noted that wells in this vicinity will be dry part of the year. The actual design of this ground-water quality monitoring system must be predicated upon site-specific hydrogeologic data. As a minimum, the parameters in List A of Table 6.2 should be monitored.

2. It is recommended that a monitoring well system similar to Site CS-1 be established for Landfill Site D-4 (1959-1958) located on the northeast side of Leon Creek in the golf course area. One monitoring well should be located hydraulically up-gradient of the site while at least two wells should be located between the trench fill area and Leon Creek. Also, one well should be located south of the landfill and north of Military Highway.

3. At the Site D-2, landfill (1942-1957), a monitoring well system similar to site CS-1 is recommended with one well located hydraulically up-gradient and three wells located hydraulically down-gradient of the landfill segment located on the southwest side of Leon Creek.

4. Monitoring well systems similar to Site CS-1 are recommended at Site E-1, Chemical Evaporation Pit (1940-1966), and Site E-3, Chemical Evaporation Pit (1966-1980). Four monitoring wells are recommended around the perimeter of each site since the local groundwater flow direction is undetermined. A common up-gradient well should be established for both sites.

5. At Site SA-2, water levels, well construction data, and site-specific geology should be obtained from the driller for the seven existing monitoring wells so that an evaluation of the existing monitoring system can be conducted. This information is necessary to determine if wells are screened in the proper geologic stratum and to determine the ability to detect pollutant migration in the surficial aquifer. If information is not available then one test

TABLE 6.2

LIST OF ANALYTICAL PARAMETERS

List A - Monitoring Well System Analytical Parameters

Chloride	Total Cyanide
Phenol	Zinc
pH	Trichloroethylene
Total Organic Halogen (TOH)	Orthodichlorobenzene
Total Organic Carbon (TOC)	Perchloroethylene
DDT	
DDE	
DDD	
Chlordane	
Silvex	
2,4,D	
Chromium	
Nickel	

List B - Sediment Sample Analytical Parameters

DDT	Mercury
DDE	Nickel
DDD	Silver
PCB	Zinc
TOC	Manganese
Arsenic	Trichloroethylene
Cadmium	Perchloroethylene
Copper	Total Cyanide
Chromium	Phenol
Lead	Orthodichlorobenzene

boring on each side of the lagoon is required to determine stratigraphic relationships and lithology.

6. A sediment analysis study should be conducted for Leon Creek to assess the waste contamination migration potential into Leon Creek from past disposal sites bordering Leon Creek. It is suggested that the sample points used for previous studies be utilized. However, additional sample points should be added as listed below to ensure sufficient sampling to detect leachate contamination near past disposal sites.

Site No.	Site Name	Minimum Number of Sediment and Water Quality Sample Points
D-1	Landfill (1917-1942)	1
D-2	Landfill (1942-1957)	3
D-4	Landfill (1954-1958)	5
D-5	Landfill (1958-1959)	2
SA-2	Industrial Sludge Lagoon	2
E-1	Chemical Evaporation Pit	2

Sediment samples should be analyzed at a minimum for the parameters in List B of Table 6.2.

7. A monitoring well system is also recommended for Site S-1, the old DPDO Storage Area. Four wells should be located around the site based on site specific hydrogeology since the surficial aquifer may or may not be continuous in the vicinity of the DPDO storage/spill site. At this time, it is suggested that the well depths be 25 feet with well screens constructed to permit sampling of the entire saturated section and water bearing materials to assess the potential for migration of contaminants to the north of the installation boundary and south towards abandoned water supply wells Nos. I-74, I-75 and I-80. At a minimum, the parameters in List A of Table 6.2 should be monitored.

8. Underground spills of petroleum products have been documented at one location (Site S-4) on Kelly Air Force Base. In order to make a preliminary determination of the severity and extent of contamination, it is recommended that surface geophysical methods such as ground penetrating radar or electrical resistivity be employed to map subsurface zones degraded by POL contamination.

OTHER RECOMMENDATIONS

1. Site E-3, Chemical Evaporation Pit (1966-1980), should be closed, graded, and revegetated. Contaminated sludges and soils should be removed. Proper closure of this site will minimize generation of leachate and reduce the potential for migration of contaminants off the installation boundary.

2. Site S-5, Underground Waste POL Storage tanks (8-25,000 gallons) located near Building 1617 should be monitored annually to detect potential leakage of waste solvents, waste POL and carbon cleaning compounds. If surface geophysical methods are used at Site S-4, as recommended above, then it would be cost-effective to employ geophysical methods to determine any paste leakage from Site S-5 since the equipment would be already on-site.

APPENDICES

APPENDIX A

PROJECT TEAM QUALIFICATIONS

J. R. Absalon, C.P.G.
W. G. Christopher, P.E.
B. D. Moreth
G. C. Patrick

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted [redacted]

Education
B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations
Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort Mc-Pherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at Robins Air Force Base in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at eight Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida.

Publications

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, with R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, with R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

Biographical Data

WILLIAM GARY CHRISTOPHER

Environmental Engineer

PII Redacted

[redacted]

Education

B.S.C.E. in Civil Engineering, (Magna Cum Laude), 1974
West Virginia University, Morgantown, W.Va.
M.E. in Environmental Engineering, 1975, University of Florida, Gainesville, Florida

Professional Affiliations

Registered Professional Engineer (Georgia No. 11886)
American Society of Civil Engineers (Associate Member)
West Virginia Water Pollution Control Federation

Honary Affilitations

Chi Epsilon
Tau Beta Pi
EPA Traineeship for Master's Degree

Experience Record

1972-1974 West Virginia Department of Highways. Morgantown, West Virginia. Highway Co-op Technician. Handled inspection of drainage, concrete structures, earthwork and compaction testing for interstate highway construction within Monongalia County and Preston County. Performed field office assignments to finalize estimates and quantities for a completed section of highway construction.

1975-1977 Union Carbide Corporation, Chemicals and Plastics Division, Environomental Engineering Department. As a process/project engineer performed environmental protection engineering for Union Carbide's Taft and Texas City Plants. Projects included process design of a rapid mix-flocculation basin for the Gulf Coast Waste

William Gary Christopher (Continued)

Disposal Authority (GCWDA) 40-Acre Facility Treatment Plant. Performed bench-scale studies of coagulant use to improve settling of aeration basin effluent bio-solids at the 40-acre facility. Predicted 40-acre facility effluent BOD and effluent TSS quality following operation changes to the existing facility including addition of a limited aeration basin to the front end of the treatment plant. Performed process feasibility and conceptual design of an aeration treatment facility for Union Carbide's Texas City plant concentrated waste stream. Performed preliminary process scope and cost appraisals for sludge disposal alternatives at Texas City including: landfarming, pressure filtration-landfill and pressure filtration-incineration. Performed settling column studies for solvent vinyl resin and suspension vinyl resin waste streams and sized settling basins from the studies. Proposed bench-scale study of the effect of ethyleneamines waste stream on anaerobic treatment of Texas City concentrated wastes. Provided review assistance for a 200-acre regional industrial landfill, in-place stabilization processes for 18-acre lagoons of primary sludge and pyrolysis fuel oil mixtures at Texas City, and source reduction projects. Evaluated at UNOX compressor piping modification for the Taft Plant to reduce power consumption by 50%. Wrote preliminary operational considerations for a proposed GCWDA regional landfarm.

1977-Date Engineering-Science, Inc. Project Engineer on study for the American Textile Manufacturers Institute and EPA. Responsible for field pilot plant study and evaluation of coagulation/clarification/multi-media filtration, carbon adsorption, ozonation, coagulation/multi-media filtration and dissolved air flotation technologies for treatment of textile industry "BPT" effluents to meet future BATEA guidelines. An ancillary portion of this project included review of existing activated sludge facilities and operational practices to meet current "BPT" limits at 5 textile mill sites.

Project engineer on study for Lederle Laboratories, Pearl River, New York plant. Responsible for wastewater treatment plant evaluation and optimization study with particular emphasis on operational changes to improve performance. Treatment processes included coagulation, flocculation, primary sedimentation, oxygen activiated sludge and final sedimentation.

William Gary Christopher (Continued)

Project manager of waste treatment operations evaluation at a pharmaceutical plant. Responsibilities included operational optimization of the full-scale activated sludge process with full-scale coagulation testing, bench-scale bioreactor studies and equalization mixing and capacity studies.

Project engineer on study to determine the impact of RCRA regulations on the coal-fired utility industry. Assisted in development of design criteria and cost methodology and estimates to compare the cost impact of RCRA 3004 and 4004 regulations on fly ash, bottom ash and FGD sludge disposal on a regional and nationwide basis.

Project Manager for review of a Permit Application and design for a proposed Hazardous Waste Disposal Facility in North Carolina.

Project Manager for preparation of a "white paper" for the Department of Energy to assess major impacts of proposed RCRA 3001, 3004 and 3006 regulations on industrial coal use for power generation.

Project Manager on study to determine biotreatability of new process wastes for a pharmaceutical chemical plant and to evaluate and define options for liquid waste incineration.

Project Manager on odor control study of process wastes for a major organic chemicals company. Responsible for laboratory bench-scale and field pilot plant study involving evaluation of liquid waste, air and steam stripping, chemical oxidation, ozonation, and activated carbon adsorption. Design criteria for a biological treatment system for the odor pretreatment effluent was also developed from bench-scale bioreactor studies.

Project Manager on a study to provide a preliminary evaluation of advanced waste treatment technologies required for upgrading an existing activated sludge facility treating organic chemical and pharmaceutical wastes with high COD and nitrogenous concentrations.

Project Manager on a biological treatability study to provide expanded waste treatment facilities for a major organic chemicals firm. Responsibilities included laboratory bench-scale and pilot scale treatability and sludge handling studies involving waste characterization, activated sludge treatability, aerobic digestion, gravity thickening, dissolved air flotation, belt filter press sludge dewatering, plate and frame pressure

filter, vacuum filter (rotary precoat), and centrifugation for nine different raw waste streams.

Project Manager for a project involving process selection and preliminary engineering design for a pulp and paper mill waste treatment facility.

Project Manager on Solid and Hazardous Waste study for a diverse chemicals and plastics production facility. Responsibilities included RCRA Interim Status Compliance, RCRA Manifest Implementation and plant training, RCRA Notification and Permit Part A applications. Detailed Solid Waste inventories by production unit and classification of wastes according to RCRA were developed. Segregation of wastes, recycle/recovery and ultimate disposal options including incineration and secure landfills were evaluated for the short-term. Long-term evaluations will be considered in Phase II of the Study.

Project Manager on Solid and Hazardous Waste study for a diverse organic chemicals manufacturing facility. Long-term alternatives for storage, handling, treatment and disposal of a variety of types of hazardous wastes were evaluated based on technical performance and economic comparisons. Alternatives evaluated included solid and liquid incineration, landfill, landfarm, solidification/fixation, and physical volume reduction (shredding,compaction).

Project Manager for a waste treatment plant capacity evaluation for a silicon wafer manufacturing facility. Bench-scale and pilot scale coagulation and settling column studies were performed in addition to field scale oxygen transfer tests to predict maximum design organic and hydraulic loadings for an existing activated sludge waste treatment facility.

Other recent projects include development of the work plan and experimental program for an American Cyanamid Company organic chemical plant primary treatment study, development of design specifications for a pharmaceutical production facility waste treatment plant and mixed liquor coagulation operations assistance for a plastics production waste treatment facility.

Technical Publications

"Magnesium Recovery from a Neutral Sulfite Semi-chemical Pulp and Paper Mill Sludge," Master of Engineering Research Project, University of Florida, Gainesville, Florida 1975.

William Gary Christopher

"Siting Considerations for Hazardous Waste Disposal Facilities," presented at the Georgia Environmental Health Association Conference, Jekyll Island, Georgia, July, 1981. (Co-author T.N. Sargent)

W. G. Christopher, "Hazardous Waste Management," Seminar presented to Capitol Associated Industries, Inc., Raleigh, North Carolina, August 21, 1981

W. G. Christopher, "A Solid and Hazardous Waste Management Program for Industrial Facilities," Industrial Wastes Magazine (publication pending), 1981.

Biographical Data

BRIAN D. MORETH

Environmental Scientist

PII Redacted

[redacted]

Education

B.S. in Forest Science, 1971 and B.S. in Zoology, 1971, Pennsylvania State University, University Park, Pennsylvania
Wildlife Management (graduate studies), Pennsylvania State University, University Park, Pennsylvania

Professional Affiliations

American Fisheries Society
Society of American Foresters
Wildlife Society

Honorary Affiliations

Phi Epsilon Phi
Phi Sigma
Xi Sigma Phi

Experience Record

1971-1973 Pennsylvania Cooperative Wildlife Unit. Research Assistant. Participated in wildlife research studies and in the design and implementation of public land use surveys. Cover mapped a parcel of state game lands by means of aerial photography and prepared suggestions for land management. Conducted research on the vegetative preferences of the ruffed grouse. Presented public lectures to organized groups and schools.

1973-1980 Buchart-Horn, Inc., Environmental Division, York, Pennsylvania. Project Scientist. Researched, prepared, and supervised aspects of environmental studies dealing with wildlife, fishery, forestry, and land use. Co-ordinated preparation of various environmental impact statements.

Prepared natural resource inventories for proposed sewer and highway construction areas and assessed possible impacts. Participated in evaluation of alternative sewage disposal systems. Coauthored a trout hatchery feasiblity

Brian D. Moreth (Continued)

study of facilities for the State of New Jersey, and prepared revegetation plans for reservoir and strip mined lands.
Served as Task Force Leader for the Environmental Quality segment of Comprehensive Water Quality Management Plan for a seven-county area in northeast Pennsylvania, which involved preparing an inventory of all natural resources and environmentally sensitive and degraded areas.

1974-1980 Pennsylvania Game Commission, York County, Pennsylvania (concurrent position). Deputy Game Protector. Responsible for enforcement of game, fish, forestry, and park laws of the Commonwealth of Pennsylvania. Assisted in public presentations including instruction of Hunter Safety Courses.

1980-Date Engineering-Science. Project Scientist. Involved in the development of environmental studies, inventories, and evaluations for municipal, industrial, and Federal government projects.
Served as Deputy Project Director of a third-party EIS for a central Florida phosphate mine. This involved preparation, direction and coordination of the multiple environmental facets associated with the construction of a new mine.
Served as Project Scientist for site and record searches of several Air Force Bases evaluating hazardous waste disposal and any biological effects associated with it.

Assisted in development of a peat mining and restoration plan for a private concern in North Carolina.

Biographical Data

GEORGE C. PATRICK

Civil and Environmental Engineer

PII Redacted

[redacted]

Education

Bachelor of Civil Engineering Degree (high honors), 1976, Georgia Institute of Technology, Atlanta, Georgia

Master of Engineering Degree in Environmental Systems Engineering, 1978, Clemson Univerity, Clemson, South Carolina

Professional Affiliations

Engineer-in-Training, 1976, Georgia
Georgia Water and Pollution Control Association
Water Pollution Control Federation

Honrary Affiliations

Tau Beta Pi

Experience Record

1971-1976 — GEORGIA ENVIRONMENTAL PROTECTION DEPARTMENT (EPD). Cooperative student (1971-1976). Duties included stream surveys, water sample analyses, wastewater treatment facility inspections, computer modeling, and report writing.

1976-1977 — EPD Field Engineer. Responsible for inspection and evaluation of wastewater treatment facilities in the State of Georgia.

1977-1978 — CLEMSON UNIVERSITY, Clemson, South Carolina. Research Assistant. Conducted bench-scale studies to evaluate biological carbon adsorption ozonation, and wet air oxidation treatment processes for a textile dyestuff. Other duties included teaching assistant for an aquatic chemistry course.

1978-Date — ENGINEERING-SCIENCE, Project Engineer. Experience has included bench-scale and pilot-scale studies, plant design and construction, specification and selection of equipment, plant operations, plant start-up and operator training. Work experience in the following industries:

Municipal
Textile
Dye Manufacture
Pesticides
Organic Chemicals (plastic)
Battery Manufacture
Petrochemical
Food and Beverage
Pulp and Paper
Metal Electroplating
Munitions

Expanded Biographical Data

George C. Patrick

1981-Date Engineering-Science, Project Manager was responsible for the design, construction and start-up a wastewater pretreatment facility for a lead acid battery manufacturer. Facility included pH adjustment, chemical addition, equalization, and clarification. Desired effluent quality was obtained after initial start-up period.

Project Manager, developed a preliminary wastewater treatment design for wine production wastewater. Project included bench scale treatability study, development of process alternatives and cost estimates.

Project Manager, evaluated treatment alternatives for the wastewaters from three pulp and paper plants. Project included data review, development of treatment alternatives and cost estimates.

Project Engineer, performed the start-up of a clarification system for the activated sludge treatment of dye production wastewaters. Project included operator training, development of an operator's strategy, and an "O&M" manual.

1980-1981 Engineering-Science, Project Manager performed the shakedown, start-up and one-month operation of a 10 MGD activated sludge treatment facility. Was responsible for developing the start-up and on-going operations strategy, operation training, sampling/analytical program, and maintenance scheduling. Desired effluent quality was achieved for entire start-up period.

Project Manager, was responsible for the operational upgrading of a municipal wastewater treatment facility. Duties included evaluating all of the treatment processes of a trickling filter plant, implementing operational strategies to improve plant performance, determining the required maintenance or replacement of equipment necessary to improve plant performance, and coordinating the efforts of the three government agencies involved in the project.

Project Engineer, was responsible for developing and writing two "O&M" manuals for the Corps of Engineers. One manual was written for a wastewater treatment facility which utilized biological treatment (RBCs) and

the other manual was written for a physical/chemical pretreatment facility which removed nitroglycerin from the wastewater. Each manual contained an introduction, theory of operation, operational procedures, preventative maintenance, troubleshooting and safety.

Project Engineer, evaluated the treatment of a pesticide production wastewater. This project involved operating bench-scale biological reactors, performing chemical analyses and evaluating technologies such as filtration and air stripping for the treatment of the production wastewater.

1978-1979 Engineering-Science, Project Engineer, determined the powdered activated carbon treatability at four textile plants. Twelve bench-scale bioreactors were used in this study.

Project Engineer, performed a bench-scale treatability study for a "grass roots" pesticide plant wastewater. The treatability study included an evaluation of both biological and physical/chemical treatment.

Project Engineer, developed a pilot plants study for a dye manu-facturing wastewater. Responsible for development of the pilot plant experimental program, operation of pilot units, and evaluation of data. Pilot units consisted of pH control, single and two stage activated sludge, multi-media filtration, granular carbon adsorption, ozonation, powdered activated carbon treatment, and oxygen activated sludge.

Project Engineer, operated two 1.0 gpm pilot plants which evaluated powdered activated carbon enhancement at a wastewater treatment plant for a knit fabric finishing plant. Study included design, construction and operation of two side-by-side pilot units.

Project Engineer, performed a bench-scale study which evaluated the biological compatability between a plastics production wastewater and a municipal wastewater treatment facility. Responsibilities included operating benchscale bioreactors, performing chemical analyses and evaluating the impact of the production wastewater on the treatment processes of the municipal facility.

APPENDIX B

INSTALLATION HISTORY

APPENDIX B

INSTALLATION HISTORY

Camp Kelly was established in May 1917 as the first military air base in the State of Texas. It was officially named Kelly Field in July 1917 in honor of Second Lieutenant George E. M. Kelly, the first military pilot to lose his life in an aircraft accident. During World War I, Kelly Field served as a reception and testing center for recruits, and as a training center for pilots, mechanics, and engineering and supply officers. The fact that both primary pilot training (the first actual flying after ground school) and instructor training were conducted brought all fliers trained during World War I to Kelly Field. Approximately 1,460 pilots and 300 flying instructors graduated in the eighteen months before Armistice Day on November 11, 1918.

In December 1917, Kelly was divided into two adjoining fields with pilot training, supply functions and warehouses located at Kelly No. 1 and flight instructor training located at Kelly No. 2. The Aviation Repair Depot was moved from Dallas to Kelly No. 1 in 1921, and in 1925, Kelly No. 1 was renamed Duncan Field in honor of Major Thomas Duncan. For the next 18 years Kelly and Duncan functioned separately.

During the 1920's Kelly remained the center for Army flight instruction. The Air Corps (later Air Service) Advance Flying School provided advanced pursuit, bombardment, observation and attack training to most of the aviators trained prior to World War II. Charles Lindbergh graduated from this school in 1925.

When the Army Air Corps shifted into high gear for World War II, it found that the expansion of both flying training at Kelly and depot logistical support at Duncan had led to dangerous flying conditions. So in March 1943 the flying school was moved to Randolph Field and the depot took over all the Kelly facilities with Kelly and Duncan consolidated under the name Kelly Field. Two years later, Kelly was further

enlarged by the annexation of the 540-acre Normoyle Ordnance Depot (now East Kelly). During World War II, Kelly developed from a center of flying activity into a huge industrial complex.

At the time World War II ended in 1945, Kelly's shops had repaired and modified thousands of airplanes of all types. Its engineering facilities established a rate of overhaul that set records for both military and commercial repair agencies. Its engine reconditioning plant turned out an average of 1,400 engines a month. After the war, activities diminished and the work force was cut back; however, the Berlin Airlift in 1948 renewed the activity at Kelly. Supporting United States involvement in the Korean War, Cuban Crisis, Vietnam War, and Israeli-Arab conflicts have brought continued activity to Kelly AFB.

Following the establishment of an autonomous Department of the Air Force, Kelly Field was renamed Kelly Air Force Base on January 29, 1948. After several name changes, the depot was designated the San Antonio Air Logistics Center. The Air Logistics Center (ALC) has since progressed to its present management of assigned systems and commodities worldwide. The ALC still provides technical advice and maintenance assistance to Air Force activities in Texas, Louisiana, Mississippi, Alabama, Tennessee, the Caribbean, and Central and South America. But more important now is its world-wide responsibility for over 240,000 stock items, over half of the Air Force engine inventory, and 16 aircraft systems.

Twenty-four tenant organizations representing 11 major Air Force commands, the U.S. Army, the Department of Defense and various other government agencies operate on Kelly Air Force Base and receive support from the 2851st Air Base Group, the host organization. The following discussion provides information on the major tenants on Kelly AFB.

Headquarters Air Force Security Service (AFSS) administers security of the vast communication network which links the many Air Force installations and units throughout the world. Communication surveillance and security for the aerospace forces is provided through more than 50 locations in 12 foreign countries and the United States using the most sophisticated electronic and cryptographic equipment available. Several security squadrons are maintained to respond to emergency situations

where permanent facilities cannot provide sufficient surveillance. The command also operates the Air Force Cryptologic Depot (AFCD) which provides other Air Force organizations with the necessary cryptographic devices and systems to maintain secure communications.

433rd Tactical Airlift Wing (AFRES) provides command and staff supervision of the 68th Tactical Airlift Squadron, Kelly AFB, Texas and 924th Tactical Airlift Group at Bergstrom AFB, Texas. These groups maintain a combat ready force of 28 UE 130B aircraft for world-wide tactical air deployment capability in support of the Military Airlift Command.

Texas Air National Guard, Headquarters 149th Tactical Fighter Group maintains a combat ready force of tactical aircraft and is actually two forces in one, serving both the state and federal governments. The group is charged by the state to "provide air units, organized, trained, equipped and ready...for the protection of life and property in time of disaster or disorder..." The federal mission plays a vital role in the defense of the country.

375th Aeromedical Airlift Wing, Detachment 5 (MAC) coordinates the movement of Department of Defense patients to hospitals within the Zone of the Interior.

USAF Postal and Courier Service, Detachment 22 provides postal and courier service for Air Force installations in the states of New Mexico, Mississippi, Texas, Arkansas, Louisiana, Colorado, Kansas and Wyoming.

1827th Electronics Installation Squadron (AFCS) is responsible for ground electronics installation and on-site depot level maintenance of Air Force ground communications, electronics and meteorological facilities in South Central United States and Central and South America.

2954 Combat Logistics Support Squadron (AFLC) provides mobile logistics support to Air Force units world wide.

General Accounting Office assists the Congress in carrying out its constitutional responsibilities with respect to the expenditure of public funds related to military activities in the San Antonio area.

General Service Agency Area Utilization Office (GSA) inspects and transfers excess property to federal agencies or Department of Defense activities.

Det 4, 3025th Management Engineering Squadron provides management engineering and manpower services in support of the military organizations.

HQ Air Force Commissary Service provides authorized personnel with food and household items, provides a system to supply troops and generate earnings to pay operating costs, recruits qualified personnel, and makes required changes in management techniques.

Det 7, 17th Weather Squadron provides general and special meteorological, environmental and climatological studies and forecasts services to Kelly AFB, Lackland AFB, Brooks AFB, Fort Sam Houston heliport and the Flying K recreation ranch.

Det 1016, AFOSI (EG) 10th District provides criminal, counter intelligence, internal security, distinguished visitors protection and special investigation services for all Air Force activities throughout Texas.

6th Weather Squadron, Detachment N06 (MAC) provides intermediate maintenance and supply support to meteorological equipment in the states of New Mexico, Texas, Louisiana and Mississippi.

AF Audit Agency Kelly Office is responsible for providing management with an independent objective evaluation of the effectiveness and efficiency with which managerial responsibilities are carried out.

Defense Property Disposal Facility SAT (DSA) performs disposal service operations (including receipt, control warehousing, and preparation of excess and surplus personal property for reutilization, donation, sale or other disposition) in support of military services and other authorized government agencies located in Texas.

U.S. Customs Service, Air Support Branch conducts air operations throughout Texas, New Mexico, Oklahoma and Colorado to detect and prevent smuggling by aircraft. Additionlly, it provides air support to other authorized federal, state, and local law enforcement agencies.

Other Tenants. On July 30, 1976, the following tenants also drew support at Kelly: USAF Clinic; Det 37, DOD Dog Center; Det 40, Munitions Supply Division, Median Training Annex; San Antonia Air Force Station; Air Force Commissary Service and Air Force Central Region Commissary Services; Air Force Data S.V.C. Center; 2750ABW - Logistics Management Specialists; 2402 Res. Adv. Sq; Army and Air Force Exchange Service - Alamo Exchange; Defense Investigative Service, District 42; Program Evaluation Management Office; San Antonio Appellate Review Office; 1702 Mod Support Squadron; MAC Air Weather Service; 67 Combat Support Group; USAF Security Agency Field Station at San Antonio.

APPENDIX C

ENVIRONMENTAL SETTING DATA

APPENDIX C
ENVIRONMENTAL SETTING DATA

BIOLOGICAL RESOURCES BASELINE ENVIRONMENT

The natural resources on Kelly AFB are those associated with a disturbed area. Several small areas, from 4 to 16 acres in size, comprise the total of 46 acres of natural brushland on Kelly AFB. No forest lands or unique natural areas exist on base. No crop cultivation or grazing is conducted on the base. Natural populations of either threatened or endangered plants or animals do not exist on the base. Most vegetation occurs as a result of landscaping. Leon Creek has fluctuating flows and supports small populations of non-game fish such as carp, suckers and gar. Some songbirds or small mammals may move through the area since there is little habitat available for them.

TEXAS SURFACE WATER QUALITY STANDARDS

The Texas Water Quality Standards water use criteria are illustrated in Table C.1.

SUMMARY OF PREVIOUS LEON CREEK SEDIMENT STUDIES

As mentioned in Section 3, several water quality and sediment studies of Leon Creek have been conducted. At various times since 1971 through 1981 the USAF OEHL, Texas Water Quality Board and Base Bioenvironmental Engineer have collected sediment and water samples at various points along Leon Creek. Figure 3.14 illustrates the location of sampling points within Kelly AFB. Appendix C, Table C.2 illustrates the combined results of the various sediment analyses which have included heavy metals, pesticides, and PCB's.

The data collected to date indicates concentrations of DDT and its metabolites DDD and DDE in sediment samples at Nos. 3, 4, 5, 6, 7, 8 and 9. DDT concentrations at Sample points 4, 5, 6, 7, 8 and 9 have ranged from 10 $\mu g/kg$ to 725 $\mu g/kg$. These results are significant since DDT is

not currently being used at Kelly AFB and a possible source is through leachate migration from landfills.

PCB's have also been detected in the sediment at Station No. 3 (golf course lake on Leon Creek) and downstream at Station Nos. 5, 7 and 8 at concentrations from 230 µg/Kg to 2300 µg/Kg. Heavy metals are contained in sediments at the discharge point 001 and downstream as illustrated in Table C.2 and Section 3 data. Upstream sediment sample points such as Sample Point No. 4 indicate chromium (177 g/Kg), copper (584 µg/Kg), lead (321-343 µg/kg) and zinc (145-158 µg/kg) contamination. Points upstream of No. 4 contain significantly less metals contamination.

This previous data suggests that the potential exists for materials disposed in Landfills D-3, D-4, D-5, D-6 and D-7 to be leaching through the alluvium stratum into the sediments of Leon Creek. However, sufficient sediment sample points have not been located in areas adjacent to the landfill areas in order to draw definite conclusions.

TABLE C.1
TEXAS SURFACE WATER QUALITY STANDARDS
FRESH AND TIDAL WATERS

SAN ANTONIO RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA						
SEGMENT											COLIFORM	
NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/ (100ml) - log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
1905	Medina River - Medina Lake headwater to Medina River headwater	X	X	X	X	40	100	400	5.0	6.5-9.0	200	88
1906	Leon Creek - Medina River confluence to SH 16 northwest of Leon Valley	X	X	X	X	120	120	700	5.0	6.5-9.0	200	95
1907*	Leon Creek - SH 16 northwest of Leon Valley to headwaters	X	X	X	X	40	75	400	5.0	6.5-9.0	200	95

* "This segment has been established in its geographical extent as that portion of the stream which is capable of recharging the Edwards Aquifer, and the Water Quality Standards for it have as a principal purpose the protection of the quality of the water infiltrating into, and therefore recharging, the aquifer."

TABLE C.2

LEON CREEK SEDIMENT SAMPLING SITES
HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
ARSENIC											
(As)	B	1.2	1.8	2.2	0.7	3.7	2.5	3.0	1.0	0.8	2.3
	C	-	-	32.0	-	12.0	26.0	11.0	30.0	20.0 20.0	-
	D	7.3	-	5.2	-	-	-	7.0	5.9	7.7	8.6
	F	-	-	-	-	-	-	-	-	5.8	6.2
	G										
	H										

FOOTNOTES
A-USAF OEHL SURVEY 1971
B-USAF OEHL SURVEY FEB 1980
C-STATE OF TX SURVEY MAY 1979
D-STATE OF TX SURVEY JAN 1980
E-STATE OF TX SURVEY FEB 1980
F-SGB-OEHL SURVEY JUN 1980
G-
H-
I-

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING SITES
HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
CADMIUM	A	0.6	0.6	0.3	-	-	2.1	42.8	17.7	-	13.0
(CD)	B	0.3	0.2	0.4	7.2	3.1	1.1	91.2	6.4	5.0	5.4
	C	< 0.5	-	0.58	-	1.7	1.7	57.0	39.0	18.0 18.0	
	D	4.7	-	6.8	-	-	-	46.5	10.4	10.3	14.2
	E	-	-	-	-	-	-	-	-	15.4	19.8
	F	0.4	0.3	0.9	14.9	3.5	3.9	89.0	16.0	11.0	3.5
	G										
	H										
CHROME	A	7.5	7.1	3.0	-	30.0	36.2	438.0	169.0	-	127.0
(CR)	B	7.7	9.8	11.7	177	68.8	18.5	1600.0	39.9	26.2	89.5
	C	30.0	-	36.0	-	84.0	53.0	970.0	420.0	120.0 130.0	-
	D	< 2.3	-	7.5	-	-	-	562.0	46.3	42.6	64.9
	E	-	-	-	-	-	-	-	-	175.0	400.5
	F	5.6	8.0	1.2	89.0	116.0	118.0	1100	118.0	96.0	86.0
	G										
	H										

FOOTNOTES

A-USAF OEHL SURVEY 1971
B-USAF OEHL SURVEY FEB 1980
STATE OF TX SURVEY MAY 1979
D-STATE OF TX SURVEY JAN 1980
E-STATE OF TX SURVEY FEB 1980
F-SGB-OEHL SURVEY JUN 1980
G-
H-
I-

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING SITES

HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
COPPER	A	6.1	2.8	4.0	-	5.0	8.5	107.0	117.0	-	40
(cu)	B	12.6	14.3	18.5	584.0	43.1	24.0	195.0	21.8	20.6	26.9
	C	14.0	-	12.0	-	39.0	23.0	140.0	170.0	46.10 99.0	-
	D	21.3	-	16.4	-	-	-	105.0	18.4	17.0	48.4
	E	-	-	-	-	-	-	-	-	53.0	31.8
	F	8.0	12.0	12.0	14.9	64.0	37.0	200.0	61.0	191.0	23.0
	G										
	H										
NICKEL	A	7.1	5.9	3.0	-	-	6.9	75.0	48.0	-	53.0
	B	4.6	9.9	7.6	16.3	130.0	6.8	1400.0	31.3	227.0	27.3
	C	20.0	-	12.0	-	17.0	14.0	710.0	41.0	29.00 100.0	-
	D	12.6	-	12.7	-	-	-	1945.0	55.6	30.0	51.8
	E	-	-	-	-	-	-	-	-	54.8	54.8
	F	40.0	9.0	7.0	11.0	17.0	14.0	4900.0	15.0	59.0	23.0
	G										
	H										

FOOTNOTES

A-USAF OEHL SURVEY 1971

B-USAF OEHL SURVEY FEB 1980

C-STATE OF TX SURVEY MAY 1979

D-STATE OF TX SURVEY JAN 1980

E-STATE OF TX SURVEY FEB 1980

F-SGB-OEHL SURVEY JUN 1980

G-

H-

I-

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING SITES
HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
LEAD	A	26.7	9.8	17.8	-	267.0	6.7	141.0	99.6	-	83.6
(Pb)	B	113.0	39.4	45.8	321.0	171.0	87.2	506.0	197.0	731.0	77.0
	C	17.0	-	34.0	-	200.0	77.0	250.0	310.0	140.0 170.0	-
	D	161.5	-	96.1	-	-	-	214.0	132.0	85.0	207.0
	E	-	-	-	-	-	-	-	-	210.0	167.0
	F	37.0	45.0	97.0	343.0	221.0	151.0	412.0	149.0	243.0	59.0
	G										
	H										
MANGANESE	A	153.0	166.0	173.0	-	220.	236.0	160.0	235.0	-	192.0
(Mn)	B	292.0	180.0	293.0	113.0	310.0	263.0	2700.0	213.0	182.0	312.0
	C	-	-	360.0	-	250.0	510.0	3120.0	240.0	410.0	-
	F	286.0	260.0	273.0	139.0	284.0	290.0	3700.0	500.0	217.0	263.0
	G										
	H										

FOOTNOTES
A-USAF OEHL SURVEY 1971
B-USAF OEHL SURVEY FEB 1980
C-STATE OF TX SURVEY MAY 1979
D-STATE OF TX SURVEY JAN 1980
E-STATE OF TX SURVEY FEB 1980
F-SGB-OEHL SURVEY JUN 1980
G-
H-
I-

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING SITES

HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
SILVER											
(Ag)	B	4.8	10.0	3.7	12.3	4.4	4.4	11.3	6.4	6.5	5.4
	C	4.2	-	3.4	-	6.0	5.8	38.0	22.0	6.8 20.0	-
	D	<2.3	-	-	-	-	-	79.6	5.6	6.6	16.0
	E	-	-	-	-	-	-	-	-	35.9	19.1
	F										
	G										
MERCURY	A	0.13	0.1	0.17	-	0.5	0.12	0.74	1.79	-	0.64
(Hg)	B	0.1	0.2	0.2	0.1	0.3	0.3	0.2	0.1	0.1	0.1
	C	0.05	-	0.04	-	0.8	0.12	0.44	0.16	0.1 0.5	-
	D										
	E										
	F										
	G										

FOOTNOTES

A-USAF OEHL SURVEY 1971 D-STATE OF TX SURVEY JAN 1980 G-

B-USAF OEHL SURVEY FEB 1980 E-STATE OF TX SURVEY FEB 1980 H-

C-STATE OF TX SURVEY MAY 1979 F-SGB-OEHL SURVEY JUN 1980 I-

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING SITES

HEAVY METALS (uG/Kg)

		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
ZINC	A	155.0	28.1	193.0	-	53.3	62.2	89.2	637.0	-	116
(Zn)	B	30.9	33.6	34.8	158.0	131.0	55.7	247.0	366.0	31.1	58.1
	C	57.0	-	83.0	-	100.0	110.0	250.0	190.0	150.0 730.0	-
	D	70.7	-	6.3	-	-	-	168.0	70.2	43.0	116
	E	40.0	36.0	2300.00	145.0	148.0	160.0	268.0	128.0	116.0	69.0
	F										
	G										
	H										
IRON	A	2700.00	6400.0	6200.0	2500.0	11000.0	6200.0	3200.0	3000.0	2400.0	8900.0
(Fe)	F	39.0	4800.0	6300.0	4400.0	6900.0	7500.0	21000.0	9000.0	4200.0	5700.0
	G										
	H										

FOOTNOTES

A-USAF OEHL SURVEY 1971
B-USAF OEHL SURVEY FEB 1980
C-STATE OF TX SURVEY MAY 1979
D-STATE OF TX SURVEY JAN 1980
E-STATE OF TX SURVEY FEB 1980
F-SGB-OEHL SURVEY JUN 1980
G-
H-
I-

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
ALDRIN	A	0.0				0.0				0.0	
	D									5.	
LDL	E			<0.5		<5.0	<0.5	<0.5	<5.0	<0.5	
5.0	G	1353	31	686	ND	290	3491	288	T	2426	1322
	H	<5.0	<5.0	<5.0	B	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CHLORODANE											
	A	0.0				0.0				0.0	
LDL	D									<100	
50.0	E			<10		<100	<10	<10	<100	67	
	F	74	60.5	23				110	34	ND	38.5
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	<20.0	<20.0	<20.0	B	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

B - BROKEN

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
DDE	A	1.0				7.0				37.0	
	B	1.0				3.2				4.2	
LDL	C	< 2.0					82		28	18.0	
5.0	D									33.0	
	E			42.0		<15.0	43.0	<1.5	<15.0	29.0	
	F	13.0	45.0	8.8				ND	480.0	110.0	112.0
	G	ND	36.0	ND	392.0	ND	ND	44.0	52.0	23.0	T
	H	<10.0	<5.0	<10.0	B	<10.0	<10.0	<10.0	<10.0	< 10.0	<10.0
SILVEX	A	0.0				0.0				0.0	
	D									20.0	
LDL	G	T	T	ND	ND	T	ND	ND	T	ND	ND
	H				B						

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
B - BROKEN

D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80

G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
METHOXYCHLOR											
	A					0.0				0.0	
LDL	D									20.0	
50.0	E			10.0		<100.0	<10.0	<10.0	<10.0	<10.0	
	G	ND	ND	ND	1297	T	ND	ND	61	ND	T
	H	<20.0	<10.0	<20.0	B	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
DDD	A	0.0				17.0				165.0	
	B	0.0				2.9				13.0	
LDL	C	<3.0					210.0		50	10.0	
5.0	D									86.0	
	E			34.0		<30.0	150.0	<3.0	<30	74.0	
	F	ND	19.0	ND				ND	48.0	13.5	16.0
	G	ND	ND	ND	ND	ND	ND	31	ND	18.0	ND
	H	<10.0	2.4	<10.0	B	<10.0	70	<10.0	<10.0	<10.0	<10.0

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

B - BROKEN

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
DDT											
	A	0.0				77.0				725	
LDL	B	0.0				5.1				243	
5.0	C	<5.0					690.0		180.0	<5.0	
	D									<25.0	
	E			16.0		<30.0	380.0	<3.0	<30.0	1060.0	
	F	ND	11.0	ND				258.0	353.0	40.0	14.0
	G	ND	23.0	ND	120.0	194.0	168.0	35.0	610.0	24.0	ND
	H	<10.0	<5.0	<10.0	B	<10.0	10.0	<10.0	<10.0	<10.0	<10.0

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
B - BROKEN

D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80

G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
METHYL PARATHION											
	A	0.0				0.0				0.0	
LDL	D									5.0	
5.0	E			<3.0		<3.0	<3.0	<3.0	<3.0	<3.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H				B						
PARATHION											
	A	0.0				0.0				0.0	
LDL	D									5.0	
5.0	E			<50.0		<3.0	<3.0	<3.0	<3.0	<3.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	H				B						

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
B - BROKEN
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/KG)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
DIELDRIN											
	A	0.0				0.0				1.9	
LDL	B	0.0				0.0				0.0	
5.0	D									3.0	
	E			2.0		2.0	2.0	2.0	2.0	2.0	
	G	N	ND	ND	ND	19.0	ND	ND	T	ND	ND
	H	<1.0	<1.0	2.1	B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ENDRIN											
	A	0.0				0.0				0.0	
LDL	E			<3.0		<3.0	<3.0	<3.0	<3.0	<3.0	
5.0	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	<1.0	<1.0	<1.0	B	1.0	1.0	<10.0	<1.0	<1.0	<1.0

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
B - BROKEN
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
LINDANE											
	A	0.0				0.0				0.0	
LDL	D									<5.0	
5.0	E		<1.0			<10.0	<1.0	<1.0	<1.0	<1.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	<5.0	<5.0	<5.0	B	<5.0	<5.0	<5.0	<5.0	< 5.0	< 5.0
DIAZINON											
	A	0.0				0.0				0.0	
LDL	D									5.0	
5.0	E			<5.0		<50.0	<5.0	<5.0	<5.0	<5.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H				B						

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

B - BROKEN

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
HEPTACHLOR											
	A	0.0				0.0				0.0	
LDL	D									<5.0	
5.0	E			<0.5		<5.0	< 0.5	<0.5	<0.5	<0.5	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	<5.0	45.0	<5.0	B	<5.0	< 5.0	<5.0	<5.0	<5.0	< 5.0
HEPTACHLOR-EPOXIDE											
	A	0.0				0.0				0.0	
LDL	D									<5.0	
5.0	E			<1.0		<10.0	<1.0	<1.0	<1.0	<1.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	<5.0	<1.0	73.0	<B	<5.0	20.0	5.0	5.0	<5.0	<5.0

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
B - BROKEN
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

LEON CREEK SEDIMENT SAMPLING

PESTICIDES ANALYSIS (uG/Kg)

PESTICIDES		NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
PARAPHENE											
	A	0.0				0.0				0.0	
LDL	D									250.0	
250	F			< 50.0		<500.0	<50.0	<50.0	< 50.0	<50.0	
	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	H	-	-	-	-	-	-	-	-	-	-

FOOTNOTES

A - TX, 9 JUL 74
B - TX, 12 MAR 76
C - TX, 1 AUG 77
D - TX, 7 DEC 78
E - TX, 10 MAY 79
F - TX, 17 JAN 80
G - OEHL, 27 FEB 80
H - SGB-OEHL, 6 JUN 80

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TABLE C.2 (CONT.)

POLYCHLORINATED BIPHENYLS

(PCB'S)

*MILLIGRAMS PER KILOGRAM (PPM)

SAMPLE POINTS	NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	NO 8	NO 9	NO 10
TEXAS 79 SURVEY	-	-	20	-	1500	20	230	2300	20	-
OEHL 80 SURVEY	<1000	<1000	<1000	TR a <1000	<1000	TR a <1000	<1000	TR a <1000	<1000	<1000
SGB JUN 80 SURVEY	ND < 0.5	ND <.05	TR <0.5	TR < 0.5	TR <0.5	0.5	TR <0.5	TR < 0.5	TR < 0.5	TR < 0.5

*DRY WEIGHT

ND: NONE DETECTED. LESS THAN THE QUANTITATIVE DETECTION LIMIT (0.5)

(1) Sampling points are not in the same exact location for the TWQB and Kelly AFB sample points. However, the sampling points are within reasonable proximity to each other and tables were developed for comparison only.

APPENDIX D

MASTER LISTS OF INDUSTRIAL SHOPS AND LABORATORIES

TABLE D.1
MASTER LISTS
INDUSTRIAL SHOPS AND LABORATORIES

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handled Hazardous Materials	Generated Hazardous Wastes (1)	Past On-Site T.S.D. (2)
AIRCRAFT DIVISION (MAB)					
Aircraft Flight Prep	363-P	(3)	X	O	
C-5 Paint Hangar	365 '71-P	(3)	X	X	
Rubber Shop	366 '67-P	375 - '67	X	X	
B52 & C5 Maintenance & Paint Hangar	375 '56-P	(3)	X	X	
Aircraft Wash Rack & Paint Stripping	385 '63-P	(3)	X	X	
Proto Aircraft Flight Pads	390 U-P	(3)	X	O	
Proto Aircraft	392A U-P	(3)	X	O	
Radom Paint Stripping	522 '81-P	522 Prev. open In '72 explosion shut down	X	X	
Fabric Shop	545 U-P	(3)	X	O	
Transient Aircraft	1610	(3)	X	O	

(1) Hazardous waste according to RCRA or a potentially hazardous waste (one which was suspected of being RCRA hazardous although insufficient data was available to fully characterize the waste).
(2) Past treatment, storage, and/or disposal activities - present activities are covered under RCRA.
(3) None recorded indicates that available records or documentation indicated no past building locations existed.
X: Yes P: Present
O: No U: Unknown

TABLE D.1 (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handled Hazardous Materials	Generated Hazardous Wastes(1)	Past On-Site T.S.D.(2)
ENGINE DIVISION (MAE)					
Plating Shop & Chemistry Lab	301 '78-P	259 57-58 258 53-78 545 40-55 324 U-53	X	X	IWP,DPDO
Chemical/ Polymer Lab	320	(3)	X	X	
Heat Treatment & Ultrasonic Cleaning	324 '74-P	(3)	X	X	Drum
Engine Repair	360 '71-P	3008 U-'71 3020 U-'71 3052 U-'71	X	X	IW
Aircraft Maintenance & X-Ray Facility	361 '70-P	(3)	X	X	
Engine Test Section	645 U-P	(3)	X	X	IW
Engine Test Cell	650	(3)	X	O	
TECHNOLOGY REPAIR (MAT) & INDUSTRIAL PRODUCTS DIVISION					
Electronics Repair	308	(3)	X	X	
Air Cond/ Compressors	312 '74-P	(3)	X	X	

(1) Hazardous waste according to RCRA or a potentially hazardous waste (one which was suspected of being RCRA hazardous although insufficient data was available to fully characterize the waste).
(2) Past treatment, storage, and/or disposal activities - present activities are covered under RCRA.
(3) None recorded indicates that available records or documentation indicated no past building locations existed.
X: Yes P: Present
O: No U: Unknown

TABLE D.1 (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handled Hazardous Materials	Generated Hazardous Wastes(1)	Past On-Site T.S.D.(2)
TECHNOLOGY REPAIR (MAT) & INDUSTRIAL PRODUCTS DIVISION (Continued)					
Fuel Access Overhaul	323 '80-P	347 U-'80	X	X	Drum Storage
Machine & Sheet Metal Shops	324	(3)	X	X	
Bearing Shop	326	(3)	X	X	
Starter & GTE Disassembly	329 U-P	(3)	X	X	
Hydraulic Bearing Section	333 '78-P	375 '57-'78	X	X	Drum-MAD
GTE Test Cells	340 '55-P	(3)	X	O	
Fuel Accessories	347 '51-P	(3)	X	X	
Pneudraulics Accessories	348 '80-P	351 '68-'80	X	X	
Plastic Unit	522 '81-P	522 Part '72 Explosion	X	X	
Special Weapons Section	1420 '58-P	1556 '53-'58	X	X	DPDO
PLANT MANAGEMENT DIVISION (MAD)					
Materials Supplies	359	(3)	X	X	DPDO, IWP

(1) Hazardous waste according to RCRA or a potentially hazardous waste (one which was suspected of being RCRA hazardous although insufficient data was available to fully characterize the waste).
(2) Past treatment, storage, and/or disposal activities - present activities are covered under RCRA.
(3) None recorded indicates that available records or documentation indicated no past building locations existed.
X: Yes P: Present
O: No U: Unknown

TABLE D.1 (Continued)

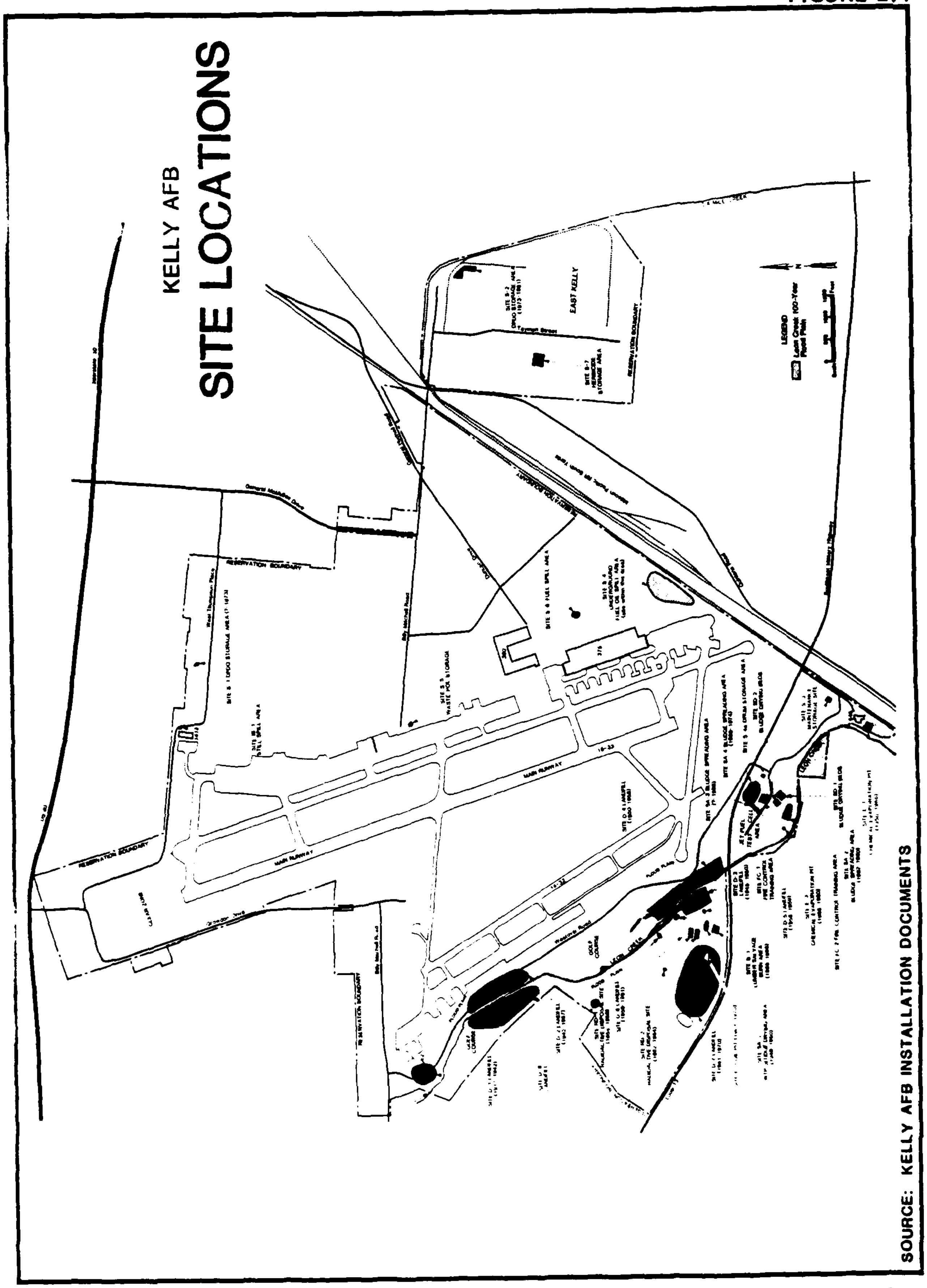
Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handled Hazardous Materials	Generated Hazardous Wastes(1)	Past On-Site T.S.D.(2)
VEHICLE MAINTENANCE BRANCH (TPM)					
Vehicle Maintenance Shops	53	52 '66-'81 57	X	X	DPDO, IWP
Refueling Equipment Shop	3003	(3)			
Lubrack	38	(3)	X	O	
Materials Handling & Forklift	50	(3)	X	X	DPDO
Paint Shop	49	(3)	X	O	
6960th Support Group			X	X	
Texas Air National Guard 149th Consol	935	(3)	X	X	
433rd Tactical Airlift Wing			X	X	

(1) Hazardous waste according to RCRA or a potentially hazardous waste (one which was suspected of being RCRA hazardous although insufficient data was available to fully characterize the waste).
(2) Past treatment, storage, and/or disposal activities - present activities are covered under RCRA.
(3) None recorded indicates that available records or documentation indicated no past building locations existed.
X: Yes P: Present
O: No U: Unknown

APPENDIX E

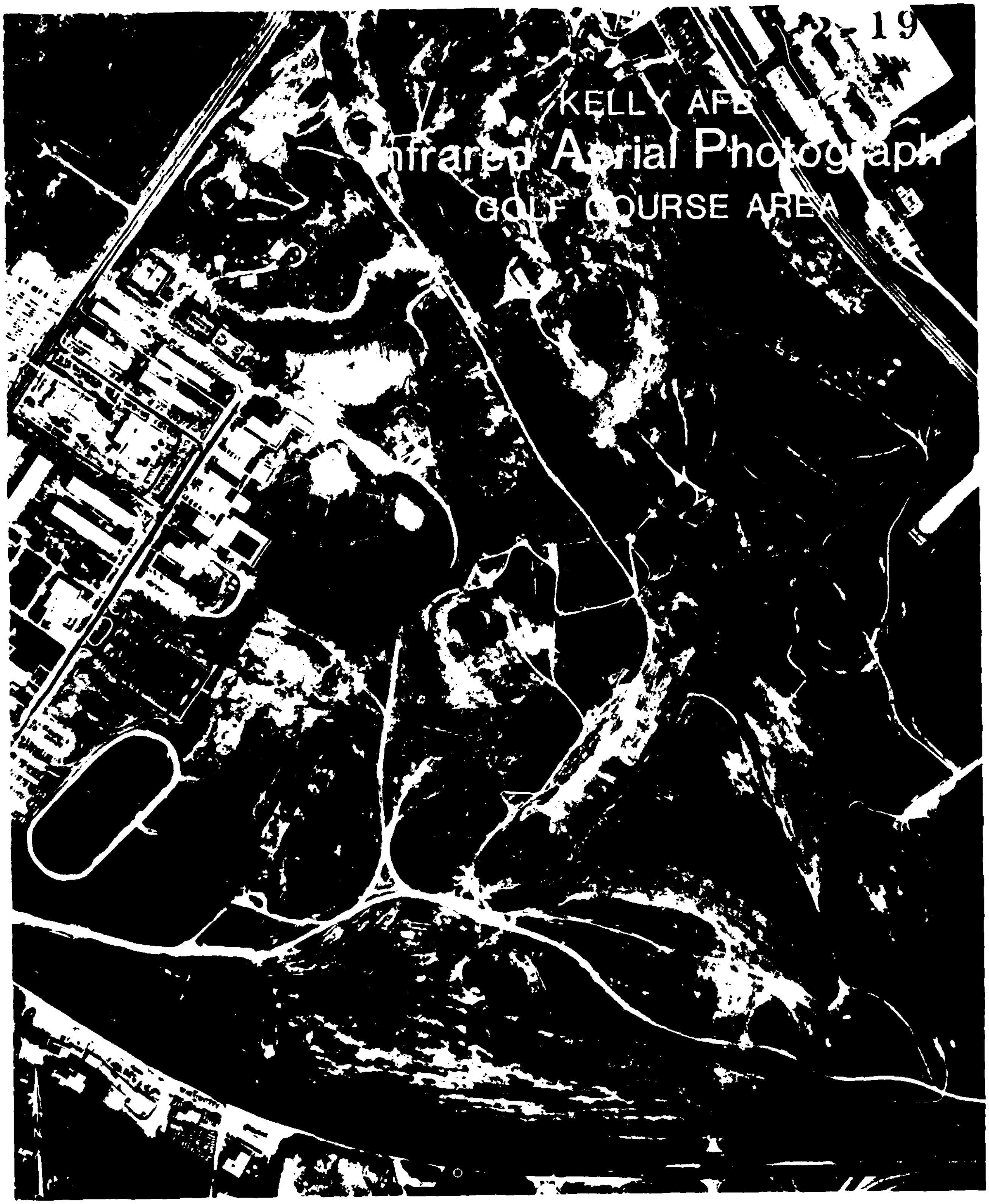
SITE LOCATION MAP

FIGURE E.1


KELLY AFB
SITE LOCATIONS
EAST KELLY
MAIN RUNWAY
RESERVATION BOUNDARY
LEGEND
Leon Creek 100-Year Flood Plain
SOURCE: KELLY AFB INSTALLATION DOCUMENTS

APPENDIX F

KELLY AFB AERIAL PHOTOGRAPH



KELLY AFB
Infrared Aerial Photograph
GOLF COURSE AREA

APPENDIX G

HAZARD EVALUATION METHODOLOGY

APPENDIX G

HAZARD EVALUATION METHODOLOGY

PRELIMINARY POTENTIAL CONTAMINATION ASSESSMENT

Various numerical methods for preliminary assessment of sites to determine the need of follow-up action have been developed. Under the auspices of EPA's Office of Enforcement, JRB Associates have devised a methodology for selecting sites for further investigation based on their potential for adverse environmental impact. A modified JRB technique has been developed by Engineering-Science and CH_2M Hill for analysis of the Phase I IRP studies (see memorandum dated July 8, 1981 at end of this Appendix). The methodology relies primarily on available information but does provide some mechanisms for handling missing data so that sites can be preliminarily rated in most cases. A brief discussion of the rating factor system of analysis follows.

Site Rating Factor System

The following four basic assessment criteria categories are used in the evaluation:

- Receptors
- Pathways
- Waste Characteristics, and
- Waste Management Practices

These categories have been further broken down into 31 generally applicable rating factors as presented in Table G-1. For each of the factors, a four-level rating scale has been developed ranging from "0" (indicating no potential hazard) to "3" (indicating a high potential hazard). These rating scales are also presented in Table G-1. It should be pointed out that these scales have been devised so that rating factors can typically be evaluated on the basis of readily available information from published materials public and private records, interviews with knowledgeable parties and site visits.

TABLE G.1

RATING FACTOR SYSTEM

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
RECEPTORS				
Population Within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands, floodplains, and preserved areas; presence of economically important natural resources	Major habitat of an endangered or threatened species; presence of recharge area
Water Quality Designation of Nearest Surface Water Body	Agricultural or industrial use	Recreation, propagation and management of fish & wildlife	Shellfish propagation and harvesting	Potable water supplies

TABLE G.1

RATING FACTOR SYSTEM (cont'd)

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
PATHWAYS				
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination - Soil/ Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 ft to 1 mile	501 ft. to 2,000 ft.	0 to 500 ft.
Depth to Groundwater	Greater than 500 ft.	51 to 500 ft.	11 to 50 ft.	0 to 10 ft.
Net Precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0 to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively permeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Depth to Bedrock	Greater than 60 ft.	31 to 60 ft.	11 to 30 ft.	0 to 10 ft.
Surface Erosion	None	Slight	Moderate	Severe

TABLE G.1

RATING FACTOR SYSTEM (cont'd)

WASTE CHARACTERISTICS

Judgemental hazardous rating from 30 to 100 points based on the following guidelines:

Points	Condition
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

TABLE G.1

RATING FACTOR SYSTEM (con'd)

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
	WASTE MANAGEMENT PRACTICES			
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre ft.	11 to 100 acre ft.	101 to 250 acre ft.	Greater than 250 acre ft.
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 ft. above high groundwater level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean groundwater level

Since the rating factors do not all assess the same magnitude of potential environmental impact, a numerical multiplier has been assigned to each factor. These multipliers were developed to indicate the relative magnitude of impact of that factor. In addition, weighting factors have been assigned to the Factor Subscores to arrive at a properly balanced Overall Score.

The following five hazard potential scores are the result of a site rating:

- Overall Score
- Receptors Subscore
- Pathways Subscore
- Waste Characteristics Subscore, and
- Waste Management Subscore.

M E M O R A N D U M

TO: Mr. Bernard Lindenberg, AFESC, Tyndall AFB, FL
Major Gary Fishburn, USAF OEHL, Brooks AFB, TX

FROM: Norman N. Hatch, Jr., CH2M HILL, Gainesville, FL NNH by E/S
Ernest J. Schroeder, Engineering-Science, Atlanta, GA E/S

DATE: July 8, 1981

SUBJECT: Joint Meeting between CH2M HILL and Engineering-Science to develop a uniform site rating system for use in all Air Force Installation Restoration Program Records Search Projects

MEETING LOCATION: CH2M HILL, Gainesville, Florida office

MEETING DATE: Monday, June 29, 1981

A. Introduction and Purpose

A joint meeting was held at the CH2M HILL Gainesville, Florida office on Monday, June 29, 1981. The purpose of the meeting was to develop a uniform site rating system for use in all upcoming Air Force Installation Restoration Program Records Search projects. Attendees at the meeting included:

- Norman N. Hatch, Jr., CH2M HILL Representative
- Ernest J. Schroeder, Engineering-Science Representative
- Major Gary Fishburn, Air Force Observer

The basis for the rating system is the document developed by JRB Associates, Inc., McLean, Virginia, for the EPA Hazardous Waste Enforcement Office, Washington, D.C. The above document presents a methodology for selecting sites for investigation based on their potential for adverse environmental impact. Careful scrutiny of this document by CH2M HILL and Engineering-Science indicated that the rating system could readily be used, with some modifications, for evaluating Air Force installation sites.

These modifications would be necessary for the following reasons:

1. The methodology presented in the JRB document was developed primarily for large landfill operations throughout the nation. Modifications are necessary to accurately address specific Air Force installation conditions.

2. The rating system must include an equivalent comparison of landfill sites and suspected contaminated sites other than landfills, e.g., PCB spills.

B. Modifications to the JRB Rating System

The specific modifications jointly developed by CH2M HILL and Engineering-Science, based on experience in performing Record Searches at several Air Force installations, are presented in the revised JRB rating form and rating factor system (attached). The modifications, in general, are summarized below:

1. Changes in multipliers for several of the rating factors in the receptors, pathways, and waste management practices categories.

2. Deletion of several existing rating factors and addition of new rating factors in the receptors, pathways, and waste management practices categories.

3. Revision of the waste characteristics category.

4. Special considerations in the use of the waste management practices category to provide meaningful comparison of landfills and contaminated areas other than landfills. These special considerations include:

   a. Use of all nine rating factors for the evaluation of landfills.

   b. Deletion of non-applicable rating factors when evaluating other contaminated areas. The category score is then normalized to provide an equivalent comparison with landfills.

CONCLUSION

All parties present at the meeting agreed that the above modifications would provide a meaningful rating system for Air Force installation sites. The system will be used in the next several Record Searches and then re-evaluated to determine if further modifications are necessary.

MMH/EJS/lmr

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site ______________________

Location ______________________

Owner/Operator ______________________

Comments ______________________

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet		4		
Distance to Nearest Drinking Water Well		15		
Distance to Reservation Boundary		6		
Land Use/Zoning		3		
Critical Environments		12		
Water Quality of Nearby Surface Water Body		6		

Number of Assumed Values = ____ Out of 6

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____%

SUBTOTALS ____ ____

SUBSCORE ____

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination		10		
Level of Water Contamination		15		
Type of Contamination, Soil/Biota		5		
Distance to Nearest Surface Water		4		
Depth to Groundwater		7		
Net Precipitation		6		
Soil Permeability		6		
Bedrock Permeability		4		
Depth to Bedrock		4		
Surface Erosion		4		

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____%

SUBTOTALS ____ ____

SUBSCORE ____

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE ______

Reason for Assigned Hazardous Rating:

____

____

____

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		7		
Hazardous Waste Quantity		7		
Total Waste Quantity		4		
Waste Incompatibility		3		
Absence of Liners or Confining Beds		6		
Use of Leachate Collection System		6		
Use of Gas Collection Systems		2		
Site Closure		8		
Subsurface Flows		7		

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = ____ Out of 9

Percentage of Missing and Non-Applicalbe Values = ____%

SUBTOTALS ______ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE ____________

(Receptors Subscore X 0.24 plus
Pathways Subscore X 0.33 plus
Waste Characteristics Subscore X 0.17 plus
Waste Management Subscore X 0.26)

RATING FACTOR SYSTEM GUIDELINES

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
RECEPTORS				
Population Within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands, floodplains, and preserved areas; presence of economically important natural resources	Major habitat of an endangered or threatened species; presence of recharge area
Water Quality Designation of Nearest Surface Water Body	Agricultural or industrial use	Recreation, propagation and management of fish & wildlife	Shellfish propagation and harvesting	Potable water supplies
PATHWAYS				
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination - Soil/Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 ft to 1 mile	501 ft. to 2,000 ft.	0 to 500 ft.
Depth to Groundwater	Greater than 500 ft.	51 to 500 ft.	11 to 50 ft.	0 to 10 ft.
Net Precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0 to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively permeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Surface Erosion	None	Slight	Moderate	Severe

WASTE CHARACTERISTICS	
Judgemental hazardous rating from 30 to 100 points based on the following guidelines:	
Points	**Condition**
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

RATING FACTORS	RATING SCALE LEVELS			
	0	1	2	3
	WASTE MANAGEMENT PRACTICES			
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre ft.	11 to 100 acre ft.	101 to 250 acre ft.	Greater than 250 acre ft.
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 ft. above high groundwater level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean groundwater level

APPENDIX H

SITE RATING FORMS

SITE RATING FORMS

TABLE OF CONTENTS

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Site CS-1

Location 1945-1970

Owner/Operator

Comments Landfill site nos. D-3, D-4, D-5, D-6, D-7, Combined site

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 111 138

SUBSCORE 80

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 131 195

SUBSCORE 67

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:
Mixed solvents, electroplating sludges, general refuse

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	3	4	12	12
Waste Incompatibility	1	3	3	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21
		SUBTOTALS	123	150
		SUBSCORE		82

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 81

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Site D-4 Landfill

Location (1954-1958)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest ...ing Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 111 138

SUBSCORE 80

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	1	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 131 195

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 90

Reason for Assigned Hazardous Rating:

Mixed solvents, electroplating sludges, general refuse

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	2	4	8	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = 2 out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 .

SUBTOTALS 116 150

SUBSCORE 77

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ out of 25

Overall Percentage of Assumed Values = ____

OVERALL SCORE 78

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site ___Site D-7 Landfill___

Location ___1961-1970) Golf course near security hill___

Owner/Operator ______

Comments ______

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	1	12	12	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = __0__ Out of 6

Percentage of Assumed Values = __0__ %

Number of Missing Values = __0__ Out of 6

Percentage of Missing Values = __0__ %

SUBTOTALS __84__ __138__

SUBSCORE __61__

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	[illegible]	4	[illegible]	12

Number of Assumed Values = __1__ Out of 10

Percentage of Assumed Values = __10__ %

Number of Missing Values = __0__ Out of 10

Percentage of Missing Values = __0__ %

SUBTOTALS __[illegible]__ __195__

SUBSCORE __65__

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:
Mixed solvents, electroplating sludges, pesticides containers, DDT drums

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	3	4	12	12
Waste Incompatibility	1	3	3	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 123 150

SUBSCORE 82

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = [illegible] Out of 25

Overall Percentage of Assumed Values = [illegible] %

OVERALL SCORE --

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Site D-3 Landfill

Location: (1945-1950)

Owner/Operator: ______

Comments: ______

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 111 138

SUBSCORE 80

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 127 195

SUBSCORE 65

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 90

Reason for Assigned Hazardous Rating:

Mixed solvents, electroplating sludges, general refuse

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	[illegible]	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	[illegible]	2	[illegible]	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21
		SUBTOTALS	[illegible]	150
		SUBSCORE		[illegible]

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE [illegible]

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Site D-5 Landfill

Location: (1958-1959)

Owner/Operator:

Comments:

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 105 138

SUBSCORE 76

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	1	7	7	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 124 195

SUBSCORE 64

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 70

Reason for Assigned Hazardous Rating:

Mixed solvents, electroplating sludges

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS [illegible] 150

SUBSCORE 75

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = [illegible] Out of 25

Overall Percentage of Assumed Values = [illegible] %

OVERALL SCORE 71

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Site D-6 Landfill

Location (1959-1961)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	1	12	12	36
Water Quality of Nearby Surface Water Body	3	6	18	18
		SUBTOTALS	99	138
		SUBSCORE		72

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	0	4	4	12
Surface Erosion	0	4	0	12
		SUBTOTALS	127	195
		SUBSCORE		65

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 70

Reason for Assigned Hazardous Rating:
Mixed solvents, electroplating sludges

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 20 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 112 150

SUBSCORE 75

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 70

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site SA-2 Sludge Spreading Area

Location Industrial Sludge Lagoon @ IWTP near Leon Creek

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	13	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18
		SUBTOTALS	91	138
		SUBSCORE		59

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	2	10	20	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	[illegible]	7	[illegible]	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12
		SUBTOTALS	[illegible]	195
		SUBSCORE		[illegible]

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
IWTP Sludge drying area

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Be.	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 95 150

SUBSCORE 63

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16%

OVERALL SCORE 54

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Site D-2 Landfill

Location (1942 - 1957)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 111 138

SUBSCORE 80

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS [illegible] [illegible]

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 70

Reason for Assigned Hazardous Rating:

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	2	4	8	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	1	8	8	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 94 150

SUBSCORE 63

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 61

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site S-1 DPDO Storage Area

Location (2-1972)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 87 138

SUBSCORE 63

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 63 195

SUBSCORE 32

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 80

Reason for Assigned Hazardous Rating:

Waste POL, Spillage, Cleaning Compound Spillage (ODCB)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	NA	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21
		SUBTOTALS	100	100
		SUBSCORE		67

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16%

OVERALL SCORE 58

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site E-1 Oil Evaporation Pit (1950 - 1966)

Location Adjacent to Building No. 545

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoring	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 57 38

SUBSCORE 41

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	2	10	20	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 116 195

SUBSCORE 59

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 80

Reason for Assigned Hazardous Rating:

Chrome plating sludges, mixed solvents and oils

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	0	8	0	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 72 144

SUBSCORE 50

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 58

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site S-4 Fuel Spill Area

Location New Building 267

Owner/Operator

Comments 9,000 gallon fuel spill in 1980 (underground pipe leak)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 87 138

SUBSCORE 63

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 62 195

SUBSCORE 32

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

9,000 gallon underground fuel leakage

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	NA	7	NA	NA
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	NA	NA	NA
Site Closure	NA	NA	NA	NA
Subsurface Flows	NA	NA	NA	NA

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 4 Out of 9

Percentage of Missing and Non-Applicable Values = 44 %

SUBTOTALS 51 78

SUBSCORE 65

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 58

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site E-1 Oil Evaporation Pits

Location (1966-1980)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 51 138

SUBSCORE 37

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 102 195

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 80

Reason for Assigned Hazardous Rating:

Mixed solvents, waste oils

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21
		SUBTOTALS	89	150
		SUBSCORE		59

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 57

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site E-2 Oil Evaporation Pit (1961-1970)

Location

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	1	12	12	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 84 138

SUBSCORE 61

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	3	5	15	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	0	4	0	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 62 195

SUBSCORE 32

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

Mixed solvents, waste oils, electroplating sludges

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 82 152

SUBSCORE 55

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 56

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site SA-4 Sludge Spreading Area

Location Near IWTP

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18
		SUBTOTALS	75	138
		SUBSCORE		54

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	0	7	0	21
Net Precipitation	3	6	18	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12
		SUBTOTALS	76	195
		SUBSCORE		39

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
IWTP Sludge Drying Area

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	1	7	7	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 1 Out of 9
Percentage of Missing and Non-Applicable Values = 11%

SUBTOTALS 75 144
SUBSCORE 52
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = [illegible] Out of 25
Overall Percentage of Assumed Values = 16%

OVERALL SCORE 53
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site SA-1 Sludge Spreading Area

Location Golf Course Area (1948 - 1950)

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	1	12	12	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 99 138

SUBSCORE 72

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	3	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	0	6	0	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 70 195

SUBSCORE 36

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
WTP Sludge disposal/drying area - Metals laden

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	1	7	7	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	1	8	8	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 78 150

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 52

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site IS-1 Still Spill Area

Location Building 1414

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18
		SUBTOTALS	87	138
		SUBSCORE		63

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12
		SUBTOTALS	73	195
		SUBSCORE		38

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Metals recovery still spillage (solvents)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	NA	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 89 150

SUBSCORE 59

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 52

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site S-6 Fuel Spill Area

Location Old Fuel Storage Tank 930

Owner/Operator

Comments 200,000 gallon leaded fuel spill occurred in mid-1960's

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 81 138

SUBSCORE 59

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 62 195

SUBSCORE 32

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

200,000 gallon spill of leaded fuel in unlined dike area. Unknown amount percolated into ground in vicinity of Building 930.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	NA	7	NA	NA
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicable Values = 22 %

SUBTOTALS 68 123

SUBSCORE 55

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 52

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfil', recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

200,000 gallon spill of leaded fuel in unlined dike area. Unknown amount percolated into ground in vicinity of Building 930.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	NA	7	NA	NA
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicable Values = 22 %

SUBTOTALS 68 123

SUBSCORE 55

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 50

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site SA-3 Sludge Spreading Area

Location Near jet cell test area

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 81 138

SUBSCORE 59

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	[illegible]	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	[illegible]	12
Surface Erosion	0	4	[illegible]	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS [illegible] 195

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

IWTP sludge spreading area

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	1	7	7	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 75 144

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16%

OVERALL SCORE 49

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA
ASSESSMENT AND RATING FORM

Name of Site S-1 DPDQ Storage (1973-1991)
Location
Owner/Operator
Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	3	4	12	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 99 138
SUBSCORE 72
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	3	5	15	45
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10
Percentage of Assumed Values = 20 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 53 225
SUBSCORE 24
(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	1	7	[illegible]	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = [illegible] Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 61 150

SUBSCORE 41

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 48

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Site S-7

Location: (Early 1970's) East Kelly Herbicide Storage Area

Owner/Operator:

Comments: Herbicide drums stored on wood pallets

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	3	4	12	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS: 99 / 138

SUBSCORE: 72

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 1 Out of 10

Percentage of Assumed Values = 10 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS: 43 / 195

SUBSCORE: 22

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

small quantities of herbicide spillage from drum storage

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	N/A	2	N/A	6
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 54 150

SUBSCORE 36

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 46

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site SD-2 Sludge Drying Bed

Location

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 81 138

SUBSCORE 59

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = [illegible] Out of 10

Percentage of Assumed Values = [illegible] %

Number of Missing Values = [illegible] Out of 10

Percentage of Missing Values = [illegible] %

SUBTOTALS [illegible] 195

SUBSCORE 39

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Sludge Drying Bed in 1940's - 1950's

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	0	6	0	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	2	8	16	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 56 144

SUBSCORE 39

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 46

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site RD-2 Radioactive Disposal Area

Location Golf Course and New Security Hill

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 105 138

SUBSCORE 76

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	0	7	0	21
Net Precipitation	3	6	18	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 40 195

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Small animals with radioactivity

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	1	8	8	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 0 Out of 9

Percentage of Assumed Values = 0 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 65 150

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 45

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Site D-1 Landfill (1917 - 1942)

Location:

Owner/Operator:

Comments:

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 72 138
SUBSCORE 52
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10
Percentage of Assumed Values = 20 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 42 195
SUBSCORE 22
(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collect[illegible] System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	0	8	0	24
Subsurface Flows	2	7	14	21
		SUBTOTALS	89	150
		SUBSCORE		59

(Factor Score Divided by Maximum Score and Multiplied by 100)

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 44

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site FC-1 Fire Control Training Area

Location Golf Course Area

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 111 138

SUBSCORE 80

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	0	7	0	21
Net Precipitation	3	6	18	18
Soil Permeability	1	6	6	18
Bedrock Permeability	1	4	4	12
Depth to Bedruck	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 44 195

SUBSCORE 22

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Contaminated Waste POL Used for Fire Training

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	NA	2	NA	NA
Site Closure	1	8	8	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 0 Out of 9

Percentage of Assumed Values = 0 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 38 144

SUBSCORE 26

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25

Overall Percentage of Assumed Values = 0 %

OVERALL SCORE 42

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA
ASSESSMENT AND RATING FORM

Name of Site FC-2 Fire Control Training Area

Location Near Sludge Holding Lagoon

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18
		SUBTOTALS	81	138
		SUBSCORE		59

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	1	7	-	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12
		SUBTOTALS	49	195
		SUBSCORE		25

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum *Score and Multiplied by 100*)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Contaminated Waste POL

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection System	NA	2	NA	NA
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21
SUBTOTALS			54	150
SUBSCORE				36

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16%

OVERALL SCORE 41

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA
ASSESSMENT AND RATING FORM

Name of Site RD-1 Radioactive Disposal Area

Location Golf Course Area Near Leon Creek

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 105 138

SUBSCORE 76

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	0	7	0	21
Net Precipitation	3	6	18	18
Soil Permeability	2	6	12	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 46 195

SUBSCORE 24

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Disposal of watch dials and misc. small radioactive materials

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	0	6	0	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection System	NA	2	NA	NA
Site Closure	1	8	8	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = 0 Out of 9

Percentage of Assumed Values = 0 %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 26 144

SUBSCORE 18

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 40

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site S-3 Maintenance Storage

Location Near First Street

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	1	15	15	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	3	6	18	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 57 138

SUBSCORE 41

(Factor Score Divided by Maximum Score and Multiplied by 100)

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	1	6	6	18
Bedrock Permeability	1	4	4	12
Depth to Bedrock	1	4	4	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 2 Out of 10

Percentage of Assumed Values = 20 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 41 195

SUBSCORE 21

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 80

Reason for Assigned Hazardous Rating:

Storage Facility for Hazardous Raw Materials - Spill Area

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	1	3	3	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	NA	6	NA	NA
Use of Gas Collection System	NA	2	NA	NA
Site Closure	NA	8	NA	NA
Subsurface Flows	0	7	0	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicable Values = 22 %

SUBTOTALS 15 102

SUBSCORE 13

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE 38

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

APPENDIX I

GLOSSARY

APPENDIX I

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

Acft Maint: Aircraft Maintenance

DE: Directorate of Civil Engineering

DEEVE: Environmental Protection Planning Section

DEEVN: Natural Resources Planning Section

PA: Public Affairs Office

SGPE: Bioenvironmental Engineering Services

AF: Air Force

AFB: Air Force Base

AFFF: Fire Control Agent

AFLC: Air Force Logistics Command

AFR: Air Force Regulation

AFSC: Air Force Systems Command

AG: Adjutant General

AGE: Aerospace Ground Equipment

ALLUVIUM: Unconsolidated sediments deposited in relatively recent geologic time by the action of running water

ARGILLACEOUS: Composed of clay minerals or clay-sized particles

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield water to a well or spring

ARENACEOUS: Sand-bearing or sandy; containing sand-sized particles

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yeilding water to a well or spring

AVGAS: Aviation Gasoline

BALCONES ESCARPMENT: The long, relatively continuous steeply sloping geomorphological feature formed by faulting that separates the Edwards Plateau (north) from the West Gulf Coastal Plain (south). The Edwards Plateau forms the upper escarpment surface, while the Coastal Plain defines the lower escarpment limits

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CHERTY: A precipitated cryptocrystalline silicate rock material. Occurs chiefly as nodules or concretions within a host rock

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

CONFINED AQUIFER: An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

D: Disposal site

DDT: 1,1,1 - Trichloro - 2,2,-bis (p-chlorophenyl) - ethane; a pesticide

DDD: 2,2 - bis-(p-Chlorophenyl)- 1,1-dichloro-ethane; a degradation product of DDT.

DDE: 1,1 - dichloro - 2,2-bis (p-Chlorophenyl)ethylene; a degradation product of DDT.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

D.O.: Dissolved Oxygen

DOD: Department of Defense

DOWNGRADIENT: In the direction of lower hydraulic head; the direction in which ground water flows

DPDO: Defense Property Disposal Office - Responsible for the disposal of excess government equipment, including office equipment, vehicles, electronic equipment and hazardous materials.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease, vectors and scavengers

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EOD: Explosive Ordnance Detachment

EPA: Environmental Protection Agency

EROSION: The wearing away of land surface by wind or water

ES: Engineering-Science, Inc.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes

FCT: Fire Control Training

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water and any contaminants that may be contained therein, as governed principally by the hydraulic gradient

GYPSEOUS: Containing the mineral gypsum

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure

GROUND-WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HALF-LIFE: The time required for half the atoms present in radioactive substance to disintegrate

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HAZARDOUS MATERIAL: A material defined as hazardous under RCRA or CERCLA

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

HERBICIDE ORANGE: 50/50 mixture of 2,4-D (2,4 dichlorophenoxyacetic acid) and 2,4,5-T (2,4,5 - Trichlorophenoxyacetic acid)

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

HYDROCHEMICAL PROPERTIES: The physical and chemical characteristics of a pollutant that govern its mobility in the ground-water system

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the Air, Human Health, and Environmental Standard

INFILTRATION: The flow of liquid through pores or small openings

IRP: Installation Restoration Program

ISOTOPE: Two or more species of atoms of the same chemical element, with the same atomic number and place in the periodic table, and nearly identical chemical properties, but with different atomic mass numbers and different physical properties; an example may be the radioactive isotope - Carbon (12) and Carbon-14

kg: Kilogram

km: Kilometer

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

mg/l: Milligrams per liter

mil: 0.001 inch

ml: Milliliter

mm: Millimeter

MGD: Million gallons per day

MOA: Military Operating Area

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

MSL: Mean Sea Level

NRC: Nuclear Regulatory Commission

ODCB: Orthodichlorobenzene

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

PCB: Polychlorinated Biphenyls are highly toxic to aquatic life; they persist in the environment for long periods and are biologically accumulative

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PD-680: Cleaning solvent

pH: Negative logarithm of hydrogen ion concentration

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

RD: Radioactive disposal site

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes enviromental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SD: Sludge drying bed

SDA: Sludge drying area

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water suply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste

S: Storage site

TAC: Tactical Air Command

TCCD: Tetrachlorodibenzo-P-Dioxin

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

TS: Test Site

μg/l: Micrograms per liter

USAF: United States Air Force

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

WL: Waste Lagoon

APPENDIX J

REFERENCES

APPENDIX J

REFERENCES

GENERAL

Sax, Irving N., Dangerous Properties of Industrial Materials, 4th Edition.

"Spill Prevention Control and Countermeasure Plan for Kelly Air Force Base," San Antonio, Texas. June 21, 1974. Revised May, 1979.

State of Texas Oil and Hazardous Substances Spill Contingency Plan." Texas Department of Natural Resources. September, 1978.

Stecher, Paul G. (ed.), Merck Index of Chemicals and Drugs, 8th Edition. 1968.

TAB A-1 Environmental narrative (Phase II). Kelly AFB, San Antonio, Texas. February 8, 1979.

GEOLOGY

Arnow, Ted, Ground-Water Geology of Bexar County, Texas. Texas Board of Water Engineers Bulletin 5911. 1959.

Arnow, Ted, Ground-Water Geology of Bexar County, Texas, U.S. Geological Survey Water Supply Paper 1588. 1963.

Baker, E.T. and Wall, J.R., Summary Appraisals of the Nation's Ground-Water Resources - Texas-Gulf Region. U.S. Geological Survey Professional Paper 813-F. 1976.

Bureau of Reclamation, San Antonio-Guadalupe River Basins Study, USBR Southwest Regional Office, Amarillo. 1978.

Garza, Sergio, Recharge, Discharge and Changes in Ground-Water Storage in the Edwards and Associated Limestones, San Antonio Area, Texas, A Progress Report on Studies 1955-59. Texas Board of Water Engineers Bulletin 6201. 1967.

Geologic Atlas of Texas, San Antonio Sheet. Texas Bureau of Economic Geology, Austin.

Harmson, Lynn, Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, U.S. Geological Survey Open File Report 78-164. 1976.

Maclay, R.W., Rettman, P.L., and Small, T.A., Hydrochemical Data for the Edwards Aquifer in the San Antonio Area, Texas. Texas Department of Water Resources Publication LP-131. 1980.

Maclay, R.W., Small, T.A. and Rettman, P.L., Application and Analysis of Borehole Data for the Edwards Aquifer in the San Antonio Area, Texas, Texas Department of Water Resources Publication LP-139. 1981.

Maclay, R.W., Small, T.A. and Rettman, P.L., Water Level, Recharge, Discharge, Specific-Capacity, Well Yield and Aquifer Test Data for the Edwards Aquifer in the San Antonio Area, Texas, Texas Department of Water Resources Publication LP-133. 1980.

Maclay, R.W. and Small, T.A., Progress Report on Geology of the Edwards Aquifer, San Antonio, Texas, and Preliminary Interpretation of Borehole Geophysical and Laboratory Data on Carbonate Rocks, U.S. Geological Survey Open File Report 76-627. 1976.

Marquardt, G.L. and Elder, G.R., Records of Wells, Chemical Analyses and Water Levels of Selected Edwards Wells, Bexar County, Texas, Texas Department of Water Resources Report 237. 1979.

McIntosh, W.E. and Behm, R.C., Geological and Foundation Investigation, Lackland Air Force Base, San Antonio, Texas. U.S. Army Corps of Engineers Fort Worth District. 1967.

Metcalf and Eddy, Inc. Edwards Aquifer Study (performed for City of San Antonio). 1979.

Muller, D.A. and Price, R.D., Ground-Water Availability in Texas, Texas Department of Water Resources Report 238. 1967.

Pearson, F.J., Rettman, P.L. and Wyerman, T.A., Environmental Tritium in the Edwards Aquifer, Central Texas, 1963-71. U.S. Geological Survey Open File Report 74-362. 1975.

Reeves, R.D., Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968-January 1975. Edwards Underground Water District Publication, San Antonio. 1976.

Reeves, R.D., Maclay, R.W., Grimin, K.C. and Davis, M.F., Records of Ground-Water Recharge, Discharge, Water Levels and Chemical Quality of Water for the Edwards Aquifer in the San Antonio Area, Texas, 1934-78. Edwards Underground Water District Bulletin 38, San Antonio. 1980.

Sellards, E.H., Adkins, W.S. and Plummer, F.B., The Geology of Texas, Volume I, Stratigraphy, University of Texas Bulletin No. 3232, University of Texas Press, Austin. 1932.

Taylor, F.B., Hailey, R.B. and Richmond, D.L., Soil Survey of Bexar County, Texas, USDA, soil Conservation Service. 1966.

WATER RESOURCES AND WATER QUALITY

Texas Water Quality Board, "Intensive Surface Water Monitoring Survey for Segment 1906 of Leon Creek," Report no. IMS 45.

Texas Department of Water Resources, "Texas Surface Water Quality Standards," LP-71. Aparil, 1981.

Texas Water Development Board, "Surface Water Quality Standards," 156.21.01.001-.011.

Texas Water Development Board, "Monitoring and Reporting System." 156.19.05.001-.010.

APPENDIX K

HAZARD ASSESSMENT RATING METHODOLOGY

KELLY AIR FORCE BASE

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

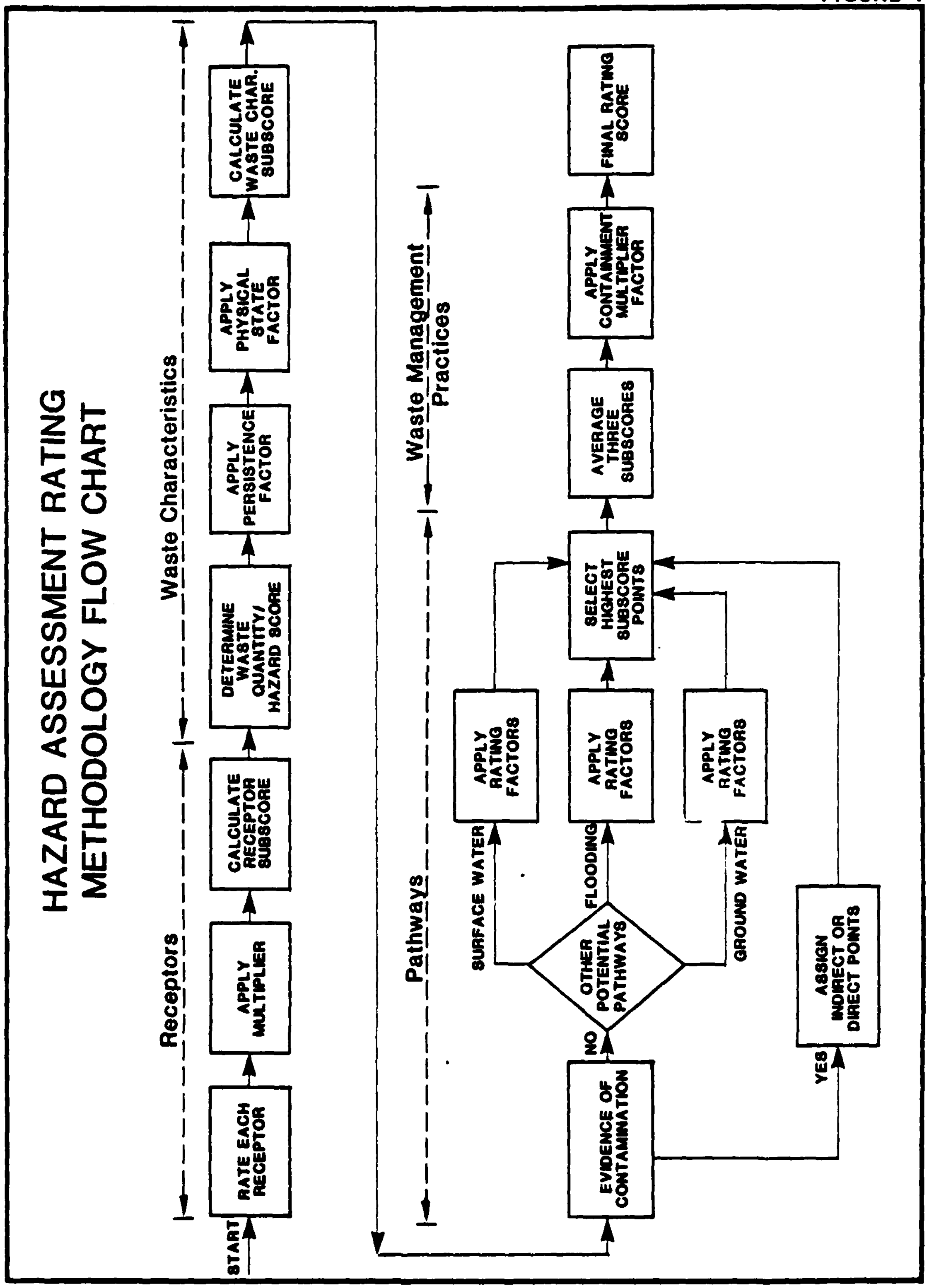
The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1



HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		

Subtotals ______ ______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in *surface water, ground water, or air*. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels: 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater [illegible] clay ($>10^{-6}$ [illegible])	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX L

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

KELLY AIR FORCE BASE

HAZARD ASSESSMENT RATING METHODOLOGY SCORES

KELLY AIR FORCE BASE

	Site	HARM Score	Page No.
1.	CS-1 (Combined Site, Landfills D-3,D-4,D-5,D-6, D-7)	83	L-1
2.	Site D-4 Landfill	83	L-3
3.	Site D-3 Landfill	83	L-5
4.	Site D-5 Landfill	75	L-7
5.	E-3 Oil Evaporation Pits	72	L-9
6.	E-1 Chemical Evaporation Pit	69	L-11
7.	S-4 Fuel Spill Area	67	L-13
8.	Site D-2 Landfill	67	L-15
9.	Site D-7 Landfill	63	L-17
10.	SA-2 Sludge Spreading Area	58	L-19
11.	S-1 DPDO Storage Area	58	L-21
12.	IS-1 Still Spill Area	57	L-23
13.	Site D-6 Landfill	57	L-25
14.	E-2 Oil Evaporation Pit	53	L-27
15.	S-2 DPDO Storage	51	L-29
16.	Site S-7	51	L-31
17.	S-6 Fuel Spill Area	49	L-33
18.	FC-1 Fire Control Training Area	49	L-35
19.	RD-2 Radioactive Disposal Area	48	L-37
20.	FC-2 Fire Control Training Area	47	L-39
21.	SA-1 Sludge Spreading Area	45	L-41
22.	S-3 Maintenance Storage	42	L-43
23.	SD-2 Sludge Drying Bed	41	L-45
24.	SA-3 Sludge Spreading Area	41	L-47
25.	SA-4 Sludge Spreading Area	40	L-49
26.	Site D-1 Landfill	36	L-51
27.	RD-1 Radioactive Disposal Area	5	L-53

August 1982

SUMMARY OF REVISED PHASE II RECOMMENDATIONS
KELLY AIR FORCE BASE

Site	Initial Score/(1) Recommendation	Revised Score/(2) Recommendation	Comments
CS-1 (Combined Site, LF D-3, D-4, D-5, D-6, D-7)	CS-1 (Combine D-3, D-5, D-7, SA-1, E-2) 81/Ground-Water Monitoring Surface Water and Sediment Monitoring	83/Ground-Water Monitoring Surface-Water and Sediment Monitoring	No Change in Recommendation
Site D 4 Landfill	78/Ground-Water Monitoring	83/Ground-Water Monitoring	No Change in Recommendation
Site D-3 Landfill	77/Ground-Water Monitoring	83/Ground-Water Monitoring	No Change in Recommendation
Site D-5 Landfill	71/Ground-Water Monitoring	75/Ground-Water Monitoring	No Change in Recommendation
E-3 Oil Evaporation Pits	57/Ground-Water Sampling	72/Ground-Water Sampling	No Change in Recommendation
E-1 Chemical Evaporation Pit	58/Ground Water Sampling	69/Ground-Water Sampling	No Change in Recommendation
S-4 Fuel Spill Area	58/Geophysical Monitoring	67/Geophysical Monitoring	No Change in Recommendation
Site D-2 Landfill	61/Ground-Water Monitoring	67/Ground-Water Monitoring	No Change in Recommendation
Site D-7 Landfill	77/Ground-Water Monitoring Surface Water and Sediment Monitoring	63/Ground-Water Monitoring Surface Water and Sediment Monitoring	No Change in Recommendation
SA-2 Sludge Spreading Area	64/Obtain Additional Well Construction Data	58/Obtain Additional Well Construction Data	No Change in Recommendation
S-1 DPDO Storage Area	58/Ground-Water Monitoring	58/Ground-Water Monitoring	No Change in Recommendation
Site D-6 Landfill	70/Ground-Water Monitoring	57/Ground-Water Monitoring	No Change in Recommendation
All Other Sites	-/None	-/None	No Change in Recommendation

(1) Hazard Evaluation Methodology, July 1981
(2) Hazard Assessment Rating Methodology, January 1982

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE CS-1 (Combined Site, Landfills D-3, D-4, D-5, D-6, D-7)
LOCATION Leon Creek Area
DATE OF OPERATION OR OCCURRENCE 1945 to 1970
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION Each Site is Closed and Covered with Several Feet of Earth
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	3	1	3	3

Subscore (100 x factor score/3) 100

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	100
Pathways	100
Total 261 divided by 3 =	87 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

87 x .95 = 83

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-4 Landfill
LOCATION North of Leon Creek
DATE OF OPERATION OR OCCURRENCE 1954 to 1958
OWNER/OPERATOR Kirkland AFB
COMMENTS/DESCRIPTION Closed, Earth Cover
SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	3	1	3	3

Subscore (100 x factor score/3) 100

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	100
Pathways	100

Total 261 divided by 3 = 87 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

87 x .95 = $\boxed{83}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-3 Landfill

LOCATION South of Leon Creek

DATE OF OPERATION OR OCCURRENCE 1945 to 1950

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Closed, Earth Cover

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	3	1	3	3

Subscore (100 x factor score/3) 100

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	100
Pathways	100
Total 261 divided by 3 =	87
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

87 x .95 = 83

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-5 Landfill

LOCATION South of Leon Creek

DATE OF OPERATION OR OCCURRENCE 1958 to 1959

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Closed, Earth Cover

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on *factor score* matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	3	1	3	3

Subscore (100 x factor score/3) 100

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
		Subtotals	40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 58
Waste Characteristics 80
Pathways 100

Total 238 divided by 3 = 79
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

79 x .95 = 75

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE E-3 Oil Evaporation Pits

LOCATION Near Jet Fuel Test Cell Area

DATE OF OPERATION OR OCCURRENCE 1966 to 1980

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Not Closed, Liquid Present in Existing Pit

SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			64	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 36

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	36
Waste Characteristics	100
Pathways	80
Total 216 divided by 3 =	72
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 x 1.0 = 72

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE E-1 Chemical Evaporation Pit

LOCATION South of Building No. 545

DATE OF OPERATION OR OCCURRENCE 1950 to 1966

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Closed, Site Closed with Earth and Gravel, Asphalt Covering

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	70	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 39

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	39
Waste Characteristics	80
Pathways	100

Total 219 divided by 3 = 73 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

73 x .95 = 69

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE S-4 Fuel Spill Area
LOCATION Adjacent Building 367
DATE OF OPERATION OR OCCURRENCE Occurred in 1980
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION 9000 Gallon Fuel Spill (Underground Pipe Leak)
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x .8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x .8 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	-	8	-	-
Direct access to ground water	0	8	0	24
Subtotals			24	90

Subscore (100 x factor score subtotal/maximum score subtotal) 27

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	80
Pathways	80

Total 210 divided by 3 = 70 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x .95 = 67

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-2 Landfill
LOCATION Golf Course Area
DATE OF OPERATION OR OCCURRENCE 1942 to 1957
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION Closed, Earth Cover
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	3	1	3	3

Subscore (100 x factor score/3) 100

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	50
Pathways	100
Total 211 divided by 3 =	70
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x .95 = $\boxed{67}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE: Site D-7 Landfill

LOCATION: Golf Course Near Security Hill

DATE OF OPERATION OR OCCURRENCE: 1961 to 1970

OWNER/OPERATOR: Kelly AFB

COMMENTS/DESCRIPTION: Closed, Earth Cover, Reseeded

SITE RATED BY: W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	100
Pathways	43

Total 199 divided by 3 = 66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x .95 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SA-2 Sludge Spreading Area

LOCATION Industrial Sludge Lagoon @ IWTP near Lean Creek

DATE OF OPERATION OR OCCURRENCE 1962 to 1980

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Inactive Site - No Covering

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x .75 = 75

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	75
Pathways	50

Total 175 divided by 3 = 58
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE S-1 DPDO Storage Area
LOCATION Adjacent to Building 1414
DATE OF OPERATION OR OCCURRENCE ???? to 1973
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION
SITE RATED BY W.G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the f... score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	80
Pathways	43
Total 173 divided by 3 =	58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____ IS-1 Still Spill Area
LOCATION ____ Building 1414
DATE OF OPERATION OR OCCURRENCE ____
OWNER/OPERATOR ____ Kelly AFB
COMMENTS/DESCRIPTION ____
SITE RATED BY ____ W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	40
Pathways	80
Total 170 divided by 3 =	57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 1.0 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-6 Landfill
LOCATION West of Leon Creek
DATE OF OPERATION OR OCCURRENCE 1959 to 1961
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION Closed, Earth Cover
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	80
Pathways	43

Total 179 divided by 3 = 60 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

60 x .95 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE E-2 Oil Evaporation Pit

LOCATION Golf Course Area

DATE OF OPERATION OR OCCURRENCE 1961 to 1970

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Waste Materials Cleared Out. A Pond Presently Exists In this Area.

SITE RATED BY W.G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direc[illegible]ss to ground water	0	8	0	24
Subtotals			24	114

Subscore (100 x factor score subtotal/maximum score subtotal) 21

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	60
Pathways	48
Total 158 divided by 3 =	53 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

53 x 1.0 = $\boxed{53}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE S-2 DPDO Storage

LOCATION East Kelly

DATE OF OPERATION OR OCCURRENCE 1973 to 1981

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION

SITE RATED BY W.B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	24	114

Subscore (100 x factor score subtotal/maximum score subtotal) 21

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	60
Pathways	35
Total 152 divided by 3 =	51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = $\boxed{51}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site S-7

LOCATION East Kelly Herbicide Storage Area

DATE OF OPERATION OR OCCURRENCE Early 1970's

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Herbicide Drums Stored on Wooden Pallets

SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	60
Pathways	35
Total 152 divided by 3 =	51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE: S-6 Fuel Spill Area
LOCATION: Old Fuel Storage Tank 930
DATE OF OPERATION OR OCCURRENCE: Mid-1960's
OWNER/OPERATOR: Kelly AFB
COMMENTS/DESCRIPTION: 200,000 Gallon Leaded Fuel Spill
SITE RATED BY: W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	[illegible]	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6		18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	84	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			24	114

Subscore (100 x factor score subtotal/maximum score subtotal) 21

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 47
Waste Characteristics 60
Pathways 41

Total 148 divided by 3 = 49
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

49 x 1.0 = $\boxed{49}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE FC-1 Fire Control Training Area

LOCATION Golf Course Area

DATE OF OPERATION OR OCCURRENCE ???? to 1950's

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	0	8	0	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	40
Pathways	56
Total 157 divided by 3 =	52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x .95 = $\boxed{49}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE RD-2 Radioactive Disposal Area
LOCATION Golf Course and New Security Hill
DATE OF OPERATION OR OCCURRENCE 1962 to 1964
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION Site Closed with 10-12 Feet of Earth Cover
SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .5 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	3	6	18	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			78	108

Subscore (100 X factor score subtotal/maximum score subtotal) 72

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	0	8	0	24
Net precipitation	3	6	18	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			26	114

Subscore (100 x factor score subtotal/maximum score subtotal) 23

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 72

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	20
Pathways	72
Total 150 divided by 3 =	50
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x .95 = $\boxed{48}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE FC-2 Fire Control Training Area

LOCATION Near Sludge Holding Lagoon

DATE OF OPERATION OR OCCURRENCE 1950's to Present

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Site Presently in Use

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			24	114

Subscore (100 x factor score subtotal/maximum score subtotal) 21

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 50
Waste Characteristics 40
Pathways 50

Total 140 divided by 3 = 47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x 1.0 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SA-1 Sludge Spreading Area
LOCATION Golf Course Area
DATE OF OPERATION OR OCCURRENCE 1948 to 1950
OWNER/OPERATOR Kelly AFB
COMMENTS/DESCRIPTION Closed with Top Soil Cover and Seeded with Grass
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B
40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore
40 x .75 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	3	8	24	24
Subtotals			58	108

Subscore (100 X factor score subtotal/maximum score subtotal) 54

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			16	114

Subscore (100 x factor score subtotal/maximum score subtotal) 14

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	30
Pathways	54

Total 140 divided by 3 = 47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x .95 = 45

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE S-3 Maintenance Storage

LOCATION Near First Street

DATE OF OPERATION OR OCCURRENCE ???? to Present

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION

SITE RATED BY W.G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			70	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 39

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	24	114

Subscore (100 x factor score subtotal/maximum score subtotal) 21

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	39
Waste Characteristics	40
Pathways	48
Total 127 divided by 3 =	42 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

42 x 1.0 = $\boxed{42}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SD-2 Sludge Drying Bed

LOCATION North of Leon Creek

DATE OF OPERATION OR OCCURRENCE 1960's

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Area Covered with Top Soil and Seeded with Grass

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .75 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	30
Pathways	50
Total 130 divided by 3 =	43 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

43 x .95 = 41

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE: SA-3 Sludge Spreading Area
LOCATION: Near Jet Cell Test Area
DATE OF OPERATION OR OCCURRENCE: ???? to 1969
OWNER/OPERATOR: Kelly AFB
COMMENTS/DESCRIPTION: Area Seeded with Grass
SITE RATED BY: W.G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .75 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	30
Pathways	43
Total 123 divided by 3 =	41
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 1.0 = $\boxed{41}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SA-4 Sludge Spreading Area

LOCATION Near IWTP

DATE OF OPERATION OR OCCURRENCE 1968 to 1974

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Area Seeded with Grass

SITE RATED BY W.H. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	84	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .75 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108

Subscore (100 X factor score subtotal/maximum score subtotal) 43

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	0	8	0	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			16	114

Subscore (100 x factor score subtotal/maximum score subtotal) 14

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 47
Waste Characteristics 30
Pathways 43

Total 120 divided by 3 = 40
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

40 x 1.0 = 40

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site D-1 Landfill

LOCATION Adjacent to Building 962

DATE OF OPERATION OR OCCURRENCE 1917 to 1942

OWNER/OPERATOR Kelly AFB

COMMENTS/DESCRIPTION Closed with 2-4 ft of Topsoil Cover

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			80	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .5 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108

Subscore (100 X factor score subtotal/maximum score subtotal) 50

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
Subtotals			48	114

Subscore (100 x factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 44
Waste Characteristics 20
Pathways 50

Total 114 divided by 3 = 38
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

38 x .95 = 36

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE: RD-1 Radioactive Disposal Area
LOCATION: Golf Course Area Near Leon Creek
DATE OF OPERATION OR OCCURRENCE: 1954 to 1958
OWNER/OPERATOR: Kelly AFB
COMMENTS/DESCRIPTION: Closed Site
SITE RATED BY: W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x .5 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	3	6	18	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			72	108

Subscore (100 X factor score subtotal/maximum score subtotal) 67

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	0	8	0	24
Net precipitation	3	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			34	114

Subscore (100 x factor score subtotal/maximum score subtotal) 30

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	20
Pathways	67
Total 145 divided by 3 =	48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x .10 = $\boxed{5}$